Entered as second class matter, April 14, 1899, at the Post Office at New York, New York, under the Act of March 3, 1879 (Sec. 415, P.L. & R.).

The MODEL ENGINEER & PRACTICAL ELECTRICIAN

A Journal of Small Power Engineering

4d

Founded 1898
13-16 Fisher St. London W.C.1

Vol. 74, No. 1810. THURSDAY, JANUARY 16, 1936. Post Free 5d.

MODELLERS!

BLUE PRINTS

Actual Official Blueprints of Railway Companies and Engineering Works supplied to order.

PHOTOGRAPHS

of Railway, Marine and Stationary Engines, showing full mechanical details.

Send for interesting List to

A. CHALLIS, 123 Cleveland St., W.1.

MODERN HEAVY-OIL ENGINES SIMPLY EXPLAINED

A Practical Handbook on the Design and Working of Internal Combustion Engines using Heavy-Oil Fuels, as applied to Stationary Power Purposes and to Transport by Land, Sea and Air.

By R. BARNARD WAY

One Hundred and thirty one Photographs, and Explanatory Drawings specially prepared by the Author. Cloth bound.

5s. 6d. POST FREE

PERCIVAL MARSHALL & CO., LTD.
13-16, Fisher Street, London, W.C.1.

MODEL ENGINEERS! Save money—
Make your own Patterns with a

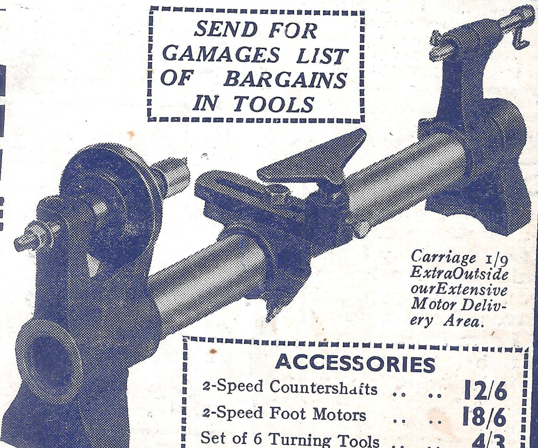
GAMAGE
WOOD TURNING LATHE

SEND FOR GAMAGES LIST OF BARGAINS IN TOOLS

British made and a really fine piece of workmanship. A sensational purchase enables us to offer these Lathes at this amazingly low price. Will turn out work up to 14in. by 5$\frac{3}{4}$in. 3in. centres, 14in. between centres, 1$\frac{3}{4}$in. diameter, bright tubular steel bed. Total length of bed 24in. Overall length 26$\frac{1}{2}$in. Headstock spindle fitted outside with washers and nut to take grinding or sanding wheel. Two-speed grooved pulley for $\frac{1}{4}$in. or $\frac{5}{16}$in. belting. Inside diameters of pulleys 1$\frac{5}{8}$in. and 2$\frac{3}{4}$in. Outside diameters of pulleys 2$\frac{1}{8}$in. and 3$\frac{1}{4}$in. Screw Feed Tailstock. Weight 20lb.

To-day's Value 35/-.

19/6

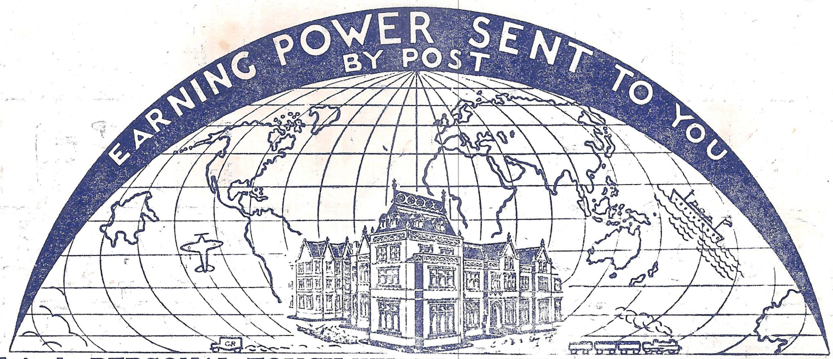


Carriage 1/9 Extra Outside our Extensive Motor Delivery Area.

ACCESSORIES

2-Speed Countershafts	12/6
2-Speed Foot Motors	18/6
Set of 6 Turning Tools	4/3
$\frac{1}{4}$in. round Leather Belt	2/-

GAMAGES, HOLBORN, LONDON, E.C.1. *'Phone: Holborn 8484. City Branch: 107 Cheapside, E.C.2.*



LET ME BE YOUR FATHER

35 YEARS PRACTICAL EXPERIENCE

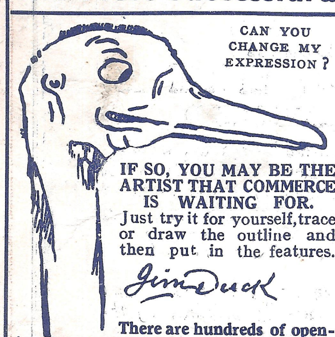
It is the PERSONAL TOUCH WHICH COUNTS in POSTAL TUITION

Let us tell YOU how to make a success of the life before you—by using your spare evenings wisely and pleasantly

LET ME BE YOUR BIG BROTHER

15 YEARS HELPING HIM

The Most Successful and Most Progressive Correspondence College in the World



IF SO, YOU MAY BE THE ARTIST THAT COMMERCE IS WAITING FOR. Just try it for yourself, trace or draw the outline and then put in the features.

Jim Duck

There are hundreds of openings in connection with Humorous Papers, Advertisement Drawing, Posters, Calendars, Catalogues, Textile Designs, Book Illustrations, etc. 60% of Commercial Art Work is done by 'Free Lance Artists' who do their work at home and sell it to the highest bidders. Many Commercial Artists draw 'retaining fees' from various sources, others prefer to work full time employment or partnership arrangement. We teach you not only how to draw **what is wanted, but how to make buyers want what you draw.** Many of our students who originally took up Commercial Art as a hobby have since turned it into a full-time paying profession with studio and staff of assistant artists; there is no limit to the possibilities. Let us send full particulars for a **FREE TRIAL** and details of our course for your inspection. You will be under no obligation whatever.

You can have a College Training in almost Any Career for a Few Shillings Monthly

- Accountancy Examinations
- Advertising and Sales Management
- A.M.I. Fire E. Exam.
- Applied Mechanics
- Army Certificates
- Auctioneers & Estate Agents
- Aviation Engineering
- Banking
- Boilers
- Book-keeping Accountancy and Modern Business Methods
- B.Sc. (Eng.)
- B.Sc. (Estate Management)
- Building, Architecture, and Clerk of Works
- Cambridge Senior School Certificate
- Civil Engineering
- Civil Service
- All Commercial Subjects
- Commercial Art
- Concrete and Structural Engineering
- Draughtsmanship, all branches
- Engineering, all branches subjects and exams.
- General Education
- G.P.O. Eng. Dept.
- Heating and Ventilating
- Industrial Chemistry
- Insurance
- Mathematics
- Matriculation, Metallurgy
- Mining, all subjects
- Mining, Electrical Engineering
- Motor Engineering
- Motor Trade
- Municipal & County Engineers
- Naval Architecture
- Pattern Making
- Police, Special Course
- Preceptors, College of
- Pumps & Pumping Machinery
- Radio Service Engineering
- Radio Communication
- Road Making and Maintenance
- Salesmanship
- Sanitation
- Secretarial Exams.
- Shipbuilding
- Shorthand (Pitman's)
- Structural Engineering
- Surveying
- Teachers of Handicrafts
- Telephony and Telegraphy
- Transport Inst. Exams.
- Welding
- Weights & Measures Inspectors
- Wireless Telegraphy & Telephony
- Works Managers

If you do not see your own requirements above, write to us on any subject

Also ask for our New Book (Free of Charge)

THE HUMAN MACHINE

SECRETS OF SUCCESS

SIGNS of the TIMES

The Budget has restored

Police Opportunities

The Air Force is to be increased

Aviation must Develop

Pay Cuts have been restored

CIVIL SERVICE

Suitable to both sexes. Ages 15½ to 24.

G.P.O. ENG. DEPT.

CUSTOMS AND EXCISE; INSP. OF TAXES, ETC. NO EXPERIENCE REQUIRED. OPEN EXAMS.

MATRICULATION

There are many ways of commencing a career, but Matriculation is the jumping-off board for all the best ones.

We prepare candidates for all

INSTITUTE EXAMS

TECHNICAL, ACCOUNTANCY, SECRETARIAL, INSURANCE, ETC.

Engineers & Draughtsmen

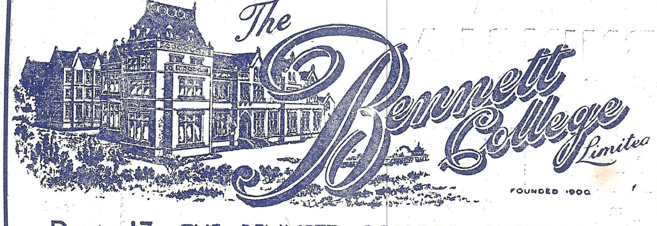
All Branches—Employers are advertising for them.

TELEPHONY, RADIO & MOTOR ENGINEERING are expanding rapidly. There are lots of vacancies. Our postal courses will make you eligible. Advice on all careers Free.

The MAN DOES NOT GO FAR WHERE ACTION LAGS BEHIND DECISION

YOUNG MEN

Young men physically fit and whose careers are not definitely fixed should join the Police Force. We have special Courses for Entrance and Promotion. 1/- per week brings success. Full Particulars Free. Address: POLICE DEPT. 17



Dept. 17, THE BENNETT COLLEGE, SHEFFIELD

EVERY DEPARTMENT IS A COMPLETE COLLEGE. EVERY STUDENT IS A CLASS TO HIMSELF.

TOOLS—MODELS—MATERIALS

EXCHANGES. I am prepared to consider taking in part exchange for any tools or models advertised, any other used tools or models in good saleable condition.

MODELS

ONE ½" SCALE COAL FIRED PACIFIC LOCO. Mr. Greenly's J-R design. Walschaerts Valve Gear. 8-Wheeled Tender. Painted and Lined. In Glass Case. Price **£30.** Further details on request.

EXCEPTIONALLY FINE ½" SCALE COAL FIRED LOCO, by Mr. R. C. Marshall. Awarded Silver Medal and Special Prize at 1933 "Model Engineer" Exhibition. Price **£50.** For photo of this loco see my advert, September 26th, last.

A VERY FINE ¾" SCALE COAL FIRED L. & N.E.R. PACIFIC LOCO. Painted and Lined. Every detail reproduced. Gresley Valve Gear. All rods properly fluted. All wheels sprung. Engine fitted with Vacuum Brakes, Tender with Hand Screw Brakes. Price **£70.**

A 3½" GAUGE (Can easily be altered to 3½" Gauge) CARSON L. & N. W. Rly, 4-4-2. Two Cylinder Inside Tank Loco. Joy Valve Gear. Water Tube Boiler. Pressure Oil fired, requires new burner. Condition as new. Price **£7 10s. 0d.**

FINE MODEL TRACTION ENGINE. Cylinder 1" × 1½", 2 Speed and Differential, with winding drum. Single Flue Coal Fired Copper Boiler. Nice job. Price **£12 10s. 0d.**

A STUART 1×1 VERTICAL ENGINE, AND A COPPER MULTI-TUBULAR BOILER TO SUIT. Fitted with Hand Pump and all fittings. Engineer made, in splendid condition. Price **£4.**

A STUART 1½ × 1½ NO. 9 HORIZONTAL ENGINE, with eccentric driven Crankshaft Force Pump, on Wooden Base, and a Babcock type Boiler with Inner Drum, Combustion Chamber and Superheater Tubes, on Base, with Casing, and all fittings. Engineer made. A very fine pair. Very good condition. Price **£7 10s. 0d.**

A SET OF SENIOR GAS ENGINE CASTINGS, ⅛h.p., with material s and drawings. Brand new. My price **22s. 6d.**

A STUART LIGHT WEIGHT PETROL ENGINE. Water Cooled, with Carburettor. Plug and Coil. Good running order. Price **35s.**

TOOLS

A 4" DRUMMOND LATHE. Complete on Makers Stand and Treadle, and to catalogue specification. No breakages, and practically as good as new. List price **£15 10s. 0d.** My price **£9 10s. 0d.**

A WATER COOLED AIR COMPRESSOR. Mounted on very substantial Girder Frame, on 4 Rubber Tyred Wheels, with Towing and Steering Bar, comprising 4 Cylinder Water Cooled Petrol Engine, Magneto Ignition, Radiator and Petrol Tank, Ignition Switch, and Carburettor Control, Single Cylinder Attwood Water Cooled Compressor, about 3½" bore, direct coupled, with Welded Steel Air Receiver, unloading and regulator Valve, and Pressure Gauge, with Covers and Side Shields, making one self-contained Portable Unit, can be used anywhere, and exceptionally useful in positions and districts where electricity is not available. Complete with Aerograph-DeVilbliss High Pressure Paint Gun, and Pressure Paint Container. Can be seen running. Price **£24.**

A POWER BENCH DRILL, regular style. Two-speed, Lever Feed. Self contained Countershaft. Spindle has tapered end, suitable to take O-⅜" Chuck. Quite good condition. Price **45/-.**

A SIMILAR MACHINE, BUT FLOOR PEDESTAL TYPE. Needs slight repair, and rebushing of Spindle. Also cleaning up and repainting. Price, to clear **32s. 6d.**

A No. 2 SENIOR VERTICAL SLIDE. 5"×5" T-Slotted Table. New. **36/-.**

A 16" 4 JAW HEAVY INDEPENDENT CHUCK. Reversible Jaws. T-slotted Body. British make. New. **£5 10s.**

THREE ONLY MACHINE VICES, Taylor Pattern. **Hardened Jaws.** Size of base 6½"×4½". Width of jaws 4". Capacity 3". List price 25/-; My price **12/6.**

A SET OF NEARLY FINISHED CASTINGS AND PARTS for a COMPOUND SWIVELLING PRECISION TYPE SLIDE REST. Suitable for a 3½" to 4½" Lathe. **30/-.**

A LARGE POLISHING HEAD. Dia. of spindle 1½". **Length** 24". Taper Screwed Ends for Buffs. Height of Centres, 12". Fast and Loose Pulleys. Weight about 1 cwt. **35/-.**

A SET OF BASTIAN-BLESSING BLOWPIPES AND SOLDERING IRON, for use with Dissolved Acetylene, for Brazing and Soldering. Price **25/-.**

A SET OF LITTLE GIANT STOCKS AND DIES, cutting ⅛, ¼ and ⅜" Gas Thread, and **ENGLISH SQUARE SPLIT DIES,** cutting ¼, ⅜, ½, ⅝, and ¾"×26 Brass Thread. There are 4 stocks and 8 pairs of adjustable dies. Good condition. **25/-** the lot.

30 ASSORTED GOOD QUALITY CUTTERS, REAMERS, TAPS AND DIES. Mostly brand new. Price **£1.**

1 DOZEN ASSORTED SMALL GRINDING WHEELS. Norton and Carborundum. New. For small internal and external work. **6/-**

MATERIALS

BRASS RODS, ROUND.—1/16", ½d.; 3/32", 1d.; ⅛" and 5/32", 1½d.; 3/16", 2d.; 7/32", 2½d.; ¼", 3d.; 9/32", 4d.; 5/16" 5d.; ⅜", 6d.; 7/16", 7d.; ½", 8d.; 9/16", 10d.; ⅝", 1/-; 11/16" 1/4; ¾", 1/6; ⅞", 2/-; 1", 2/8; 1⅛" 3/4; 1¼", 4/-; 1⅜", 5/-; 1½", 6/-; 1¾", 8/-; 2", 10/-; 2¼", 14/-; 2½", 18/-; 3", 24/- per foot.

BRASS RODS, SQUARE OR HEXAGON.—⅛", 1½d.; 5/32", 2d.; 3/16", 2½d.; 7/32", 3d.; ¼", 4d.; 5/16", 6d.; ⅜", 7d.; 7/16", 8d.; ½", 10d.; ⅝", 1/3; ¾", 2/-; ⅞", 2/8; 1", 3/4; 1¼", 5/-; 1½", 7/6; 1¾", 10/-; 2", 12/- per foot.

FLAT BRASS AND BRIGHT MILD STEEL RODS. All sizes in stock. Sizes and prices quoted in my full list. Post free on application.

ROUND, SQUARE & HEXAGON BRIGHT MILD STEEL RODS. —HALF PRICE OF BRASS RODS.

FLAT RODS. Brass, Copper, and Bright Mild Steel. All sizes in stock. See my full list. Post free on application.

BRASS TUBES, ROUND.—3/32", 2½d.; ⅛", 3d.; 5/32", & 3/16", 3½d.; 7/32" & ¼", 4d.; 9/32" & 5/16", 5d.; ⅜", 6d.; 7/16", 7d.; ½", 8d. 9/16" & ⅝", 10d.; 11/16" & ¾", 1/-; 13/16", & ⅞", 1/3; 15/16" & 1", 1/6; 1⅛", 1/9; 1¼", 2/-; 1⅜", 2/2; 1½", 2/4; 1⅝", 2/6; 1¾", 2/8; 1⅞", 2/10; 2", 3/-; 2¼", 3/3; 2½", 3/6; 2¾", 3/9; 3", 4/- per foot. Larger sizes quoted for.

COPPER TUBES, ROUND.—3/32" & ⅛", 3d.; 5/32" & 3/16", 3½d.; 7/32" & ¼", 4d.; 5/16", 5d.; ⅜", 6d.; 7/16", 7d.; ½", 8d.; 9/16" & ⅝", 10d.; ¾", 1/-; ⅞", 1/3; 1", 1/6; 1⅛", 1/9; 1¼", 2/-; 1⅜", 2/3; 1½", 2/6; 1¾", 2/9; 2", 3/2; 2¼", 3/6; 2½", 3/9; 2¾", 4/-; 3", 4/6; 3⅛", 4/10; 3¼", 5/4; 3⅜", 5/8; 3½", 6/-; 4", 6/6; 4½", 8/-; 5", 9/6; 6", 12/6 per foot.

RIVETS, SNAPHEAD, AND COUNTERSUNK IN BRASS, COPPER AND STEEL.—Ask for full list.

SHEET METAL.

Thickness:	1/64"	1/32"	3/64"	1/16"	3/32"	⅛"	5/32"	3/16"	¼"
Brass	1/2	2/2	3/-	4/-	6/-	8/-	10/-	12/-	16/-
Copper	1/4	2/6	3/6	4/6	6/9	9/-	11/6	13/6	17/6
Aluminium ..	10d.	1/2	1/9	2/4	3/6	4/8	—	7/-	9/6
Steel	6d.	9d.	1/-	1/3	1/9	2/6	3/-	3/9	5/-

All per square foot.

STEEL PLATE, BRIGHT FINISH, 4" and 6" Wide.

4" × 1/16", 11d.; ⅛", 1/6; 3/16", 2/4; ¼", 2/8; ⅜", 3/4; ½", 4/4; per foot run.

6" × 1/64" 4d.; 1/32", 8d.; 3/64", 1/-; 1/16", 1/3; 3/32", 1/9; ⅛", 2/3 5/32", 2/9; 3/16", 3/3; ¼", 4/-; ⅜", 5/-; ½", 6/6 per foot run.

NICKEL SILVER HAND RAIL KNOBS.—Exceptionally fine finish. Small size, suitable for up to ½" scale, 2/- dozen. Large size, suitable for ¾" scale, 2/6 dozen.

SPECIAL ROD FOR HAND RAILS, 2d. per 3' lengths.

POST PAID ON INLAND MATERIAL ORDERS, 10/- AND UPWARDS. ORDERS UNDER 10/- AND ALL ORDERS FOR TOOLS AND MODELS, POSTAGE OR CARRIAGE EXTRA. PACKING MACHINE TOOLS AND MODELS EXTRA AT COST. FULL METAL AND SCREW PRICE LISTS POST FREE ON APPLICATION. FULL STOCK OF TAPS, DIES, REAMERS, TWIST DRILLS, AND ALL SMALL TOOLS. BEST MAKES, LOWEST PRICES. SEND LIST OF YOUR REQUIREMENTS.

J. HEATH 459, Romford Road, FOREST GATE, E.7. **LONDON**

'Phone: Maryland 2034.

INSTRUCTIVE AND HELPFUL BOOKS

PRACTICAL ARMATURE WINDING. By ALFRED H. AVERY, A.M.I.E.E. A guide to the principles and practice of armature winding, particularly in the smaller sizes. 71 illustrations, and bound in stout cloth cover. Price **3s. 4d.** post free.

WALSCHAERTS' VALVE GEAR FOR WORKING MODELS. By HENRY GREENLY, A.I.Loco.E. Every type of engine needs a special setting out of the valve gear. This little book explains "Why" and "How." 64 pages. 63 photographs and drawings. Price **1s.**; post free **1s. 2d.**

THE "CUTTY SARK." By C. N. LONGRIDGE. Gives authentic data of the original vessel and full instructions and drawings for building a perfect scale model. Two volumes, well illustrated with photographs and drawings. Volume I: Hull, Bulwarks and Deck Fittings. Volume II: Masts, Spars and Rigging. **7s. 6d.** each Volume; postage, **6d.** each Volume inland, **8d.** each Volume abroad.

SHOPS, SHED AND ROAD. By "L.B.S.C." A Manual of Small Power Steam Locomotive Construction. 176 pages; 130 illustrations. **5s.**; post free **5s. 3d.**

ENGLISH WARSHIPS IN THE DAYS OF SAIL. By A. GUY VERCOE. Beautifully illustrated (*vide* Press). **3s. 6d.**; post free **3s. 10d.**

MOTOR BOATING FOR ALL. By A. H LINDLEY-JONES. Illustrated by R. BARNARD WAY. Deals with Construction, Equipment and Cruising. Over 150 pages; 73 illustrations. **2s.**; post free **2s. 4d.**

ELECTRIC CLOCKS AND CHIMES. Gives complete instructions for the making of successful electrical timepieces. **3s. 6d.** post free **3s. 9d.**

ELECTRIC MOTOR MANAGEMENT. By A. H. AVERY, A.M.I.E.E. A guide to selection and upkeep. **3s. 6d.**; post free **3s. 10d.**

PRACTICAL LESSONS IN METAL TURNING. By PERCIVAL MARSHALL, C.I.Mech.E. The best instruction book on the lathe for young engineers and amateur mechanics. **3s.**; post free **3s. 3d.**

BRITISH OIL ENGINES. By W. A. TOOKEY, M.I.Mech.E. A practical guide to the choice, installation and management of modern heavy oil and paraffin engines. 176 pages; 23 illustrations. **2s. 6d.**; post free **2s. 9d.**

RAY CONTROLLED MECHANISM. By Major RAYMOND PHILLIPS. Explains various methods of mechanism control by wireless, sound and light. 96 pages; 42 illustrations. **2s. 6d.**; post free **2s. 9d.**

HOME PAINTING MADE EASY. A winter and summer spare-time hobby. **2s. 6d.**; post free **2s. 8d.**

THE BEGINNER'S GUIDE TO THE MICROSCOPE. With a section on Mounting Slides. By CHAS. E. HEATH, F.R.M.S. Over 100 pages. Fully Illustrated. Price **2s.**; post free **2s. 4d.**

ELECTRICAL CIRCUITS SIMPLY EXPLAINED. By F. H. TAYLOR. A very novel form of handbook, containing 70 blue-prints in miniature of all kinds of electric circuits. **2s.**; post free **2s. 3d.**

PRIVATE HOUSE ELECTRIC LIGHTING. By F. H TAYLOR, A.M.I.E.E. Describes modern methods in wiring and fitting. **1s. 6d.**; post free **1s. 8d.**

PRINTING FOR AMATEURS and Small Printers. By ARNOLD SELWYN, **1s. 6d.**; post free **1s. 8d.**

MOTOR-CAR BATTERIES. A Practical Garage Handbook dealing with Charging, Repairs and Maintenance; also a useful chapter on the Charging and Repair of Radio Batteries. 86 pages, 27 illustrations. Price **1s. 6d.**; post free **1s. 8d.**

TELEVISION FOR ALL. By CHARLES G. PHILP. The story of Television for the non-technical reader. Illustrated **1s.**; post free **1s. 2d.**

THE "MODEL ENGINEER" HAND-BOOKS

Price 9d. each Post Free 10d.

No.
1.—Small Accumulators.
2.—Soldering, Brazing, and the Joining of Metals.
3.—Electric Bells and Alarms.
4.—Telephones and Microphones.
5.—Electric Batteries.
6.—Model Boiler Making.
7.—Metal Working Tools and Their Uses.
8.—Simple Electrical Working Models.
9.—Simple Mechanical Working Models.
10.—Small Dynamos and Motors.
11.—Induction Coils for Amateurs.
12.—Model Steamer Building.
13.—Machinery for Model Steamers.
14.—Small Electric Motors.
15.—Simple Scientific Experiments.
16.—Meteorological Instruments.
17.—The Locomotive Simply Explained.
18.—Simple Experiments in Static Electricity.
19.—X-Rays Simply Explained.
20.—Patents Simply Explained.
21.—Mechanical Drawing Simply Explained.
22.—Electric Lighting for Amateurs.
23.—Model Steam Turbines.
24.—Small Electrical Measuring Instruments.
25.—The Beginner's Guide to the Lathe.
26.—Gas and Oil Engines Simply Explained.
27.—A Guide to Standard Screw Threads and Twist Drills.
28.—Model Steam Engines.
29.—Simple Photographic Experiments.
30.—Simple Chemical Experiments.
31.—Electrical Apparatus Simply Explained.
32.—The Wimshurst Machine.
33.—Alternating Currents.
34.—Magnets and Magnetism.
35.—Optical Instruments Simply Explained.
36.—Windmills and Wind Motors.
37.—Wireless Telegraphy Simply Explained.
38.—Micrometers, Slide Gauges, and Callipers.
39.—Electric Hand and Cycle Lamps.
40.—A Small Power Electric Light Plant.
41.—Milling in Small Lathes.
42.—Magnetos Simply Explained.
43.—Hardening and Tempering Engineers' Tools.
44.—Model Petrol Engines.
45.—Planing and Shaping.
46.—Fifty Useful Tools for the Home Workshop.
47.—Simple Lathe Accessories.
48.—Gear Wheels Simply Explained.
49.—Screw-cutting Simply Explained.
50.—Clock Repairing and Adjusting.
51.—Watch Repairing and Adjusting.
52.—Working Model Railways—How to build and run them.
53.—Small Transformers.
54.—Model Steamer Fittings.
55.—Model Sailing Ship Fittings.

MODERN HEAVY OIL ENGINES. By R. BARNARD WAY. A Practical Handbook on the Design and Working of Internal Combustion Engines using Heavy-Oil Fuels, as applied to Stationary Power Purposes and to Transport by Land, Sea and Air. 131 photographs, and explanatory drawings specially prepared by the Author. Cloth bound. **5s. 6d.** post free.

ENGINEERING MATHEMATICS SIMPLY EXPLAINED. By H. H. HARRISON. A splendid text-book for apprentices, students and engineers. **2s. 6d.**; post free **2s. 9d.**

THE FRENCH POLISHER'S HANDBOOK. Tells how to polish from the white, how to renovate furniture, gild and re-gild, how to polish inlaid, marqueterie, fretwork and poker-work, with many recipes for stains and polishes. **2s.**; post free **2s. 2d.**

USEFUL ENGINEERS' CONSTANTS FOR THE SLIDE RULE. How they are obtained. By J. A. BURNS. 78 pages. **2s.**; post free **2s. 2d.**

PRACTICAL ENGRAVING ON METAL. A well-illustrated book which also deals with saw-piercing, carving and inlaying. **1s. 6d.**; post free **1s. 8d.**

MOTOR-CAR BATTERIES. A Practical Garage Handbook dealing with Charging, Repairs and Maintenance. 86 pages; 27 illustrations. **1s. 6d.**; post free **1s. 8d.**

EVERYBODY'S BOOK OF AEROPLANES. By R. BARNARD WAY. With numerous drawings by the author. A popular guide to the principles of flight and to the ready identification of the notable machines of the day. **1s. 6d.**; post free **1s. 8d.**

MODEL STEAMERS AND MOTOR BOATS. How to build and run them. Fully illustrated. Price **1s. 6d.**; post free **1s. 8d.**

R.M.S. "MAURETANIA." The Ship and her record. By GERALD AYLMER. Price **1s. 6d.**; post free **1s. 8d.**

EVERY BOY'S BOOK OF ELECTRICITY. By R. BARNARD WAY. A first introduction to the principles of Electricity and a simple explanation of modern Electrical Appliances and Machines. 105 pages; 62 illustrations. **1s.**; post free **1s. 2d.**

MODEL AEROPLANES SIMPLY EXPLAINED. By M. R. KNIGHT. An introduction to the principles of Model Aviation, with complete instructions for building the successful flying model "Avis." 101 pages; 84 illustrations. **1s.**; post free **1s. 2d.**

PLANNING AND LAYOUT. By HENRY GREENLY, A.I.Loco.E. A practical guide to the planning of Indoor and Outdoor Railways. Fully illustrated with plans to suit various locations and running conditions. **1s.**; post free **1s. 2d.**

SIGNALS AND SIGNALLING. By HENRY GREENLY, A.I.Loco.E. A practical guide to the construction of Model Signals and Signalling Systems for Model Railway working. 58 illustrations. **1s.**; post free **1s. 2d.**

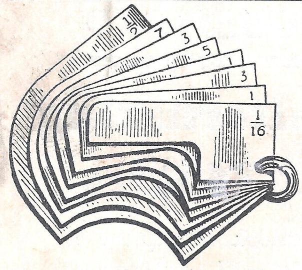
HOW A STEAM ENGINE WORKS. By W. E. M. CURNOCK. 62 pages; 27 illustrations. **9d.**; post free **10d.**

PRACTICAL HAND FORGING. By Capt. RICHARD TWELVETREES. Outlining the principal operations connected with forging, welding and the use of appliances for dealing with anvil work. 64 pages; 40 illustrations. **9d.**; post free **10d.**

SMALL ALTERNATING CURRENT MOTORS. By ALFRED H. AVERY. A practical handbook of Fractional Horse-Power A/C Motors with Rules for the Estimation of New Windings. **1s. 6d.**; post free **1s. 9d.**

If you require books not mentioned above, please send your enquiries. If you require any special book and know the price, send your order, with postage, and we will procure it for you. Full Book-List sent with each order.

PERCIVAL MARSHALL & Co., Ltd., 13-16, Fisher St., Southampton Row, London, W.C. 1.



"RING" Radius Gauges

Each gauge gives the internal and external radii. The profile is continued beyond the ends of both radii giving edges at 90° which is a great aid to quickness and accuracy. Do not guess the radius you require but get a set of radius gauges and be sure.

2/6 per Set. In metal case 1/- extra.

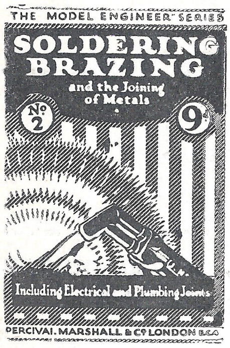
Also made in Metric and Decimals.

The "UNIQUE" Test Indicator

For testing the truth of work in the lathe or on the machine table. Fixes to any scribing block. Any variation from perfect truth is shown by the indicator to a thousandth part of an inch.

3/6 each from any Tool Dealer.

J. H. GRANT, ERITH, KENT.



THE MODEL ENGINEER SERIES.

No. 2.

SOLDERING, BRAZING

AND THE JOINING OF METALS

Revised and partially re-written from the original of

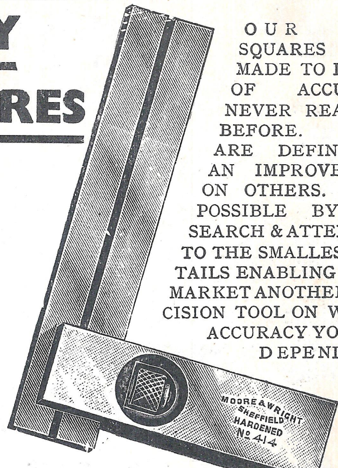
THOMAS BOLAS, F.C.S., F.I.C.

Price **9d.** *Post free* **10d.**

PERCIVAL MARSHALL & CO., LTD.

13-16 Fisher St., London, W.C.1.

ENGINEER'S TRY SQUARES



OUR TRY SQUARES ARE MADE TO LIMITS OF ACCURACY NEVER REACHED BEFORE. THEY ARE DEFINITELY AN IMPROVEMENT ON OTHERS. MADE POSSIBLE BY RESEARCH & ATTENTION TO THE SMALLEST DETAILS ENABLING US TO MARKET ANOTHER PRECISION TOOL ON WHOSE ACCURACY YOU CAN DEPEND.

Illustration shows No. 414 Adjustable

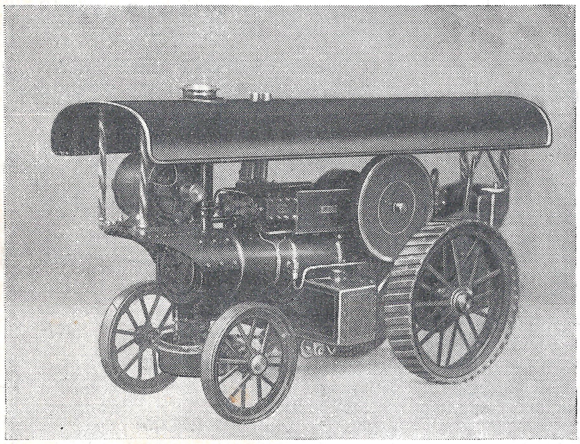
8/6

Send for complete list now.

BUY ONLY "BRANDED" TOOLS

MOORE & WRIGHT (Dept. 1)

(SHEFFIELD) LTD. : ENGLAND



A DRUMMOND '3½'

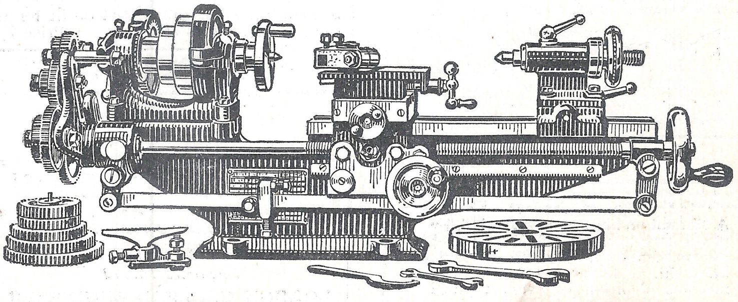
was used in making this fine working model

SHOWMAN'S ENGINE

(awarded Silver Medal at the recent "Model Engineer" Exhibition).

The maker of this fine model says:—

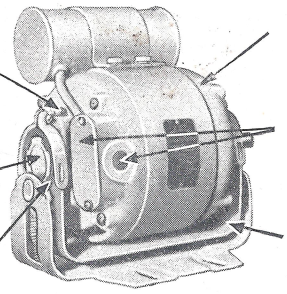
"All the turning, boring and milling was found to be very accurate and a high finish was always obtainable on any kind of work. All screwcutting was particularly simple to carry out, and the same high standard of finish always resulted. Almost any work could be done on this lathe, and no difficulties were experienced in carrying out the work on the traction engine."



DRUMMOND BROS. LTD. RISE HILL. GUILDFORD.

B T-H

FRACTIONAL H.P. CAPACITOR MOTOR



● FOR SILENT RUNNING ●

Result of the most modern research on quiet operation

Send for particulars

There are more B.T.H. Fractional H.P. Motors in service in this country than of any other make.

BTH RUGBY

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, RUGBY, ENGLAND

A2084N

JUST PUBLISHED

Small Alternating Current Motors

A practical handbook descriptive of Types, Running Characteristics, Starting Arrangements and the General Applications of Fractional Horse-Power Alternating Current Motors, with Rules for the Estimation of New Windings.

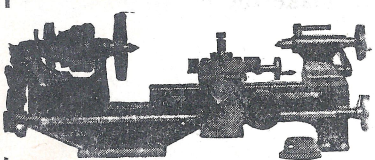
By

ALFRED H. AVERY, A.M.I.E.E.

1/6, post free 1/9

PERCIVAL MARSHALL & Co. Ltd.
13-16 Fisher Street, Southampton Row, London, W.C.I

"IDEAL" LATHES



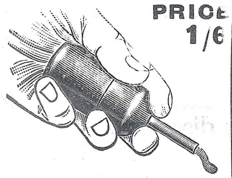
3 in. S.C. Lathes from £4 . 0 . 0
3½ in. S.C.B.G. Lathe £7 . 18 . 6

"Lathe working O.K. Highly satisfied with accuracy."—From a user.

J. WILLIMOTT & SON,
Neville's Factory, CHILWELL, Notts.

THE FLUXITE GUN

PRICE 1/6



is always ready to put Fluxite on the soldering job instantly. A little pressure places the right quantity on the right spot and one charging lasts for ages. The Gun is also used for grease like an oil can for oil.

FLUXITE

is the most effective flux invented, and has been used for 30 years in Government works. It is also used for case hardening and for tempering steel. Ask for leaflet.

Of all Ironmongers, in tins, 4d., 8d., 1/4, 2/8

Also ask to see the **FLUXITE SOLDERING SET,** a small-space but substantial outfit for the car tool kit or jobs at home. Price 7/6.

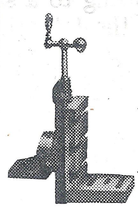
FLUXITE Ltd. (Dept 79), Dragon Works, Bermondsey Street. S.E.1

BUCK & RYAN

310-12 Euston Rd. N.W.1

Agents for TOM SENIOR'S

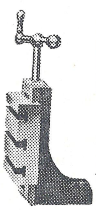
VERTICAL SLIDES



SWIVELLING TYPE

	Size No. 1 Table 5″x4″ To suit Lathes 3½″ & 4″	Size No. 2 Table 6″x5″ To suit Lathes 4″ & 4½″
Without Angle Base ..	45/-	50/-
Angle Bracket Base (*as illustrated*)	9/-	11/-

NON-SWIVELLING TYPE



Size of Table	To suit Lathes	
3½″ x 4″ ..	2½″—3″ ..	28/6
4″ x 4½″ ..	3″—3½″ ..	30/-
5″ x 5″ ..	4″—4½″ ..	36/-
6″ x 6″ ..	5″ ..	47/6
7″ x 7″ ..	6″ ..	55/-

Send for Leaflets, post free.

GREGORY & TAYLOR, Ltd.

9, HOWARD ST., SHEFFIELD, 1

Supply Adept, Drummond, Gray, Willimott, Union, Portass and Pool Lathes for cash or on terms to suit your convenience. Small Electric Motors a speciality. Send us your enquiries for any make of any kind of Workshop Equipment, for cash or on terms.

PRACTICAL BOILER FIRING

A Manual on Scientific Operation, by H. C. Armstrong and C. V. Lewis, of Messrs. Firth-Brown Ltd., Steelmakers, Sheffield. Covering hand and mechanical firing of every type of boiler, small and large.

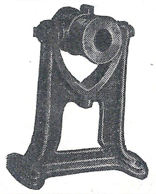
Price 4s. 0d. Post 6d. Abroad 8d.

C. GRIFFIN & CO. (R.A. DEPT.)
42, Drury Lane, London, W.C.2.

MIDGET IGNITION COILS AT 10/-

Also CAR COILS at COMPETITIVE PRICES
Enquiries Invited.

LONDON GENERAL ENGINEERS Ltd., Abbey Works, Mount Pleasant, Alperton, MIDDLESEX.
Telephone: WEMBLEY 1907.



ADJUSTABLE SWIVEL BEARINGS: 1″ and 1¼″

Suitable for Bench or Roof. Depth Base to Centre 7″ 3/9
Shafting: 1″, 9d.; 1¼″, 1/2 ft
M.S. Collars, 1/-, 1/3 each

GREGORY and SUTCLIFFE (M.E.)
Viaduct St., Huddersfield

The
MODEL ENGINEER
Edited by
PERCIVAL MARSHALL C.I.Mech.E

Business Dept.: ALFRED DAWSON.
Tech. Research and Workshop Dept.:
ALFRED W. MARSHALL, M.I.Mech.E A.M.I.E.E.

Editorial and Publishing Offices:
13-16 FISHER STREET, W.C.1

Single copies, 4d., post free 5d.
Annual Subscription, 21s. 8d., post free.

VOL. 74. No. 1810. JANUARY 16, 1936. PUBLISHED EVERY THURSDAY 4d.

SMOKE RINGS

The "M.E." Speed Boat Competition.

OUR 1935 competition produced eight entries in the various classes. The full results will be given in next week's issue, but I may mention meanwhile that the Brothers Innocent have returned the best speed, 41.18 m.p.h., for which they receive the Silver Medal in Class A, and become the holders of the Windermere Cup. The top speeds in the other classes are Mr. W. Tomkinson, in Class B, with 37.6 m.p.h., and Mr. A. Martin in Class C, with 26 m.p.h., for a flash-steam boat, and Mr. D. Innes with 21.9 m.p.h. with an I.C. boat. Mr. L. J. French returned a speed of 24.74 m.p.h. with an I.C. boat in Class C, but unfortunately, owing to a slight discrepancy in the length of the tethering cord, his boat was not timed over the full course of 300 yards. He therefore just misses the Silver medal to which he would otherwise have been entitled, but will receive a complimentary diploma. His speed trial was made on the first day his boat was tried out, at the end of December, and both the hull and engine show considerable originality in design and construction. I sympathise with Mr. French in his misfortune, but I am quite sure we shall hear of some fine work by his new boat during the coming season. Although the "M.E." Competition does not apply to overseas boats, there are signs of both enthusiasm and achievement in the United States and in Australia. I hear that Mr. Wm. C. Lieber, of Port Washington, N.Y., has made a speed of 24.85 m.p.h., with a Class C boat, and that Mr. Luke has made 37 m.p.h. with a Class B boat. In Australia Mr. Cowen, of the Sydney Society, has put up a world's record of 44.99 m.p.h. with his "Whirlwind" a single-step metre hydroplane, with a flash steam plant. This fine performance should stimulate flash-steam enthusiasts at home to get busy and produce something even better. I hope to be able to publish some details of "Whirlwind" in due course.

* * *

Good Work in Durban.

IN a letter of good wishes from the Durban Society of Model Engineers and Craftsmen, the Chairman, Mr. R. A. Maclean, writes:—"I happen to occupy the chair of the Durban 'gang' meantime and a better or more loyal crowd would be hard to find. As you have written on many occasions, there is an eagerness to help present in the make-up of all model-makers, which has helped to make the hobby what it is. Since last Xmas, when we were fortunate in having 'the Professor' with us, this Society has put model-making definitely on the map of this city, mainly through our first Exhibition, held during last Easter week. This effort enabled us to donate £113 to our morning newspaper's pet charity, the 'Natal Mercury' Children's Camp Fund, which, incidentally, we started with a capital of £5 and finished up with this sum intact. One result of this effort has been the granting of permission by the 'Mercury' to me to furnish a 'write-up' on models and model-making twice a month, as a result of which our membership roll has doubled itself. We are now organising a larger Show in July, 1936—July is the Durban 'season'—and I shall write you later about a really representative exhibit from the Old Country."

* * *

Points from my Post-Bag.

DURING the past few weeks my mail has brought me some illuminating comments on the doings of model engineers, which show how very varied are the conditions under which they carry on their hobby. For example, Mr. H. Fincham, of South Africa, writes me from Oslo. He says: "I am over here for a few weeks; worked

my way over for the experience, which I would not like again! On the way over I had reason to bestow my silent blessings on your worthy head. I had not taken much in the way of literature, but fortunately had brought the 'M.E.' Handbook, 'Milling in Small Lathes,' This I read from cover to cover, again and again; it made good reading each time, and served to pass the hours. I have not seen an 'M.E.' for some weeks, as my newsagent in Cape Town is keeping them till I get back. Then what a treat it will be!" Here is a note from Mr. J. C. F. Miller, of Venezuela: "While on a visit to a neighbouring town I became acquainted with a Venezuelan model maker who has been a regular reader of the MODEL ENGINEER for the last five years. He is Dr. Eduardo Palacios, and he has built a coal fired 1/2" scale 'Pacific', a steam ship, a model of the yacht 'Shamrock' and he is now building a petrol driven bi-plane. He tells me that probably the greatest moment in his life was when his 'Pacific' gave it's first puff and spattered hot oil all over the ceiling." Mr. V. G. Willcox writes from on board the M.V. *Silveryew*, at New York: "Since I last wrote to you we have again got under way, after being wrecked off Halifax, N.S., and have again completed a voyage round the World." Another letter from New York comes from Mr. Bertram R. White, who says: "Volume 72 of the 'M.E.' recently arrived; it is my seventy-first. It is a most remarkable hold that the 'M.E.' has upon its readers, as I do not suppose that I am different from many others. I started to read the 'M.E.' nearly 37 years ago, in January, 1899, and since that time I have been interested in various sports and hobbies, and dropped them, have taken all sorts of magazines and dropped them, but my liking for the 'M.E.' has never wavered. I was 18 when I got the first number and still look eagerly towards the receipt of each new volume. Some years ago it was necessary for me to dispose of all of my books, including the 'M.E.'s' but I have all the volumes from Volume 47 to 72 now on hand. I do not know how many times I have read them over. I like mechanical work but have done very little model work. I have made various things for the house, and have done quite a lot of radio work. As I have lived in a New York flat, my only workshop is my bedroom and an ordinary lathe or other machine tool is out of the question. If I could have found a small lathe in this country I would probably have gone in more for model work. However, I did come across the little 'Adept' some time ago and bought one with vertical slide, chucks and other gadgets. It seems to be an excellent little machine when used with discretion. Since getting this I have been considering trying to do more model work within the scope of the machine, possibly one of the 17/64" scale electrically driven locomotives which are popular over here. I would prefer steam, but rivetting, flanging and brazing simply can't be done in my bedroom. In the meantime I have been practising doing various odd jobs in the little lathe." A reader on the Gold Coast writes: "The 'M.E.' continues to reach me regularly, and it is like receiving a Christmas present each mail day it arrives." Nearer home, Mr. H. S. J. Wheeler, of Fareham, writes: "I was very pleased with the plate of the pretty vertical engine in this week's 'ours.' Please do not forget the horizontals! I am a reader since Volume IV., and I still get a thrill when I see a steam engine at work, a sight, alas, all too rare nowadays. Needless to say, I am also beam engine mad! A very nice model in this week's 'M.E.' too." My morning mail is a constant source of interest and pleasure to me, and from whatever part of the world it comes, I regard each letter as being from one of a very large family I am proud to own as readers of the "M.E."

* * *

A Model Engineering Journal for Australia.

I HAVE just received a copy of a new model engineering journal, published in Sydney, for the benefit of Model Engineers in Australia. It is entitled, "The Model Engineer in Australia and New Zealand." It is a very creditable production and contains 32 pages of matter on speed boats, model railways, model loco building, model aircraft, ship modelling, railways, and club news. It is to be published monthly at 6d., and is obtainable from 28, Martin Place, Sydney, N.S.W. The annual subscription is 5s., post free. Mr. A. M. Chalmers is the editor, and with him is associated Mr. W. J. Smith. I appreciate the compliment the publishers have paid me in adopting a title so closely resembling the one and only "M.E." but I think I ought to explain that in no sense is the new journal a localised edition of my own paper, nor have I any interest in it other than wishing it the success with which I feel sure it will deserve. I mention this in case some confusion should arise in the minds of my own readers "down under," or in the newspaper distributing trade. The new paper should do good work in encouraging model engineering in Australia, and in bringing enthusiasts in that vast country closer together.

Percival Marshall

SHOPS SHED & ROAD

A Column of "Live Steam."

By "L. B. S. C."

The Record Greeting !

Honestly, brothers all, I don't know how to start my usual puff of steam this week. Don't feel like writing at all; just kind of want to go around and shake hands with everybody who sent a kindly word of greeting and good wishes. It was a record; and if wishes mean anything, I'll surely be one of the luckiest arabs on the face of this earth during this year. As I write, the holiday is just over, and cards are still coming in from distant parts of the world; none the less welcome through being a little belated. I haven't counted all the cards yet, but they run into three figures and then some; beside which, I received many letters, and a few little tokens of regard. One of these was especially appropriate; an overseas brother wrote "Mind you keep the Live Steam notes well on the pin," and to make certain of it, enclosed "the tool for the job," in the shape of a splendid fountain pen of world-wide fame.

They say there's nothing in mental telepathy. Well, don't you believe it—listen to this. I've had a pocket knife for years, and have ground the blades to such an extent that they sink right into the handle when closed, the thumbnail nicks for opening the blades going out of sight and making the knife confoundedly awkward to open. I've also carried a steel folding rule, which incidentally has been used for many other things beside measuring (you know the way it goes, I'll bet !); the edges were nicked, and the joints like a sloppy valve gear. It was my intention to replace both articles at an early date, but I had never mentioned the fact to anybody. Judge of my astonishment and intense pleasure (though old in years, I'm still a child at heart, and not ashamed to own it) when a brother in the Black Country sent me a little two-compartment leather case containing a rustless steel folding rule, and a ditto knife, "hoping I'd find them useful." Gee-whiz—can you beat that ?

I'll never be able to reply to everybody direct, much as I'd love to, as I've only one pair of hands, and time is flying; but I sincerely and heartily thank you one and all, especially the few brothers who say that whilst they don't agree with all my precept and practice, extend the hand of friendship all the same. That's the stuff to give 'em ! If such sentiments could only be applied to every walk of life, what a fine place the world would be to live in !

A "Baernegum" "Mary Ann."

Most brothers know about the American engineman who said the Southern works were at Birmingham, and his British cousin who said they were at Eastleigh; just before "blowing-off point," they suddenly realised that both were right—Birmingham, Alabama, and Eastleigh, Hants ! It might also be disputed that L.N.E.R. engines are built in the little village up in the Midlands, seeing that it is a special preserve of the G.W. and L.M.S.; but they surely are, as will be seen by the reproduced picture which shows a 2½" gauge J. 39 class 0-6-0 built to the notes on "Mary Ann," by Mr. L. E. Boll, of King's Heath.

The little locomotive was not quite complete when the photograph was taken, a few details such as guard irons, couplings, vacuum pipes, etc., still remaining to be fitted; but apart from a little difference in such details as chimney, boiler mountings and so on, she is a pretty faithful copy of the original "Mary Ann," and there is no need to describe her in full. She is a good worker, and has made several creditable non-stop runs over Mr. L. H. Wilmot's long continuous track at King's Norton, hauling her owner and Mr. Wilmot's small daughter. This young lady is herself an engine-driver of more than average skill, and can handle her father's 2½" and 3½" gauge locomotives "as to the manner born." Bro. Boll makes apology for the workmanship and

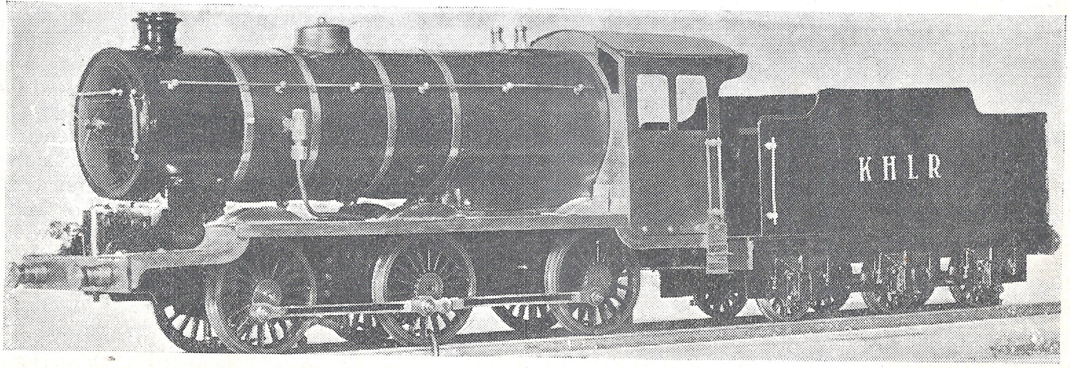


Photo by] Mr. L. E. Boll's "Mary Ann." [*H. J. Homer*

finish of his engine, but he has nothing to worry about. She looks well, and goes well, and he deserves a word of commendation. He is now at work on a 3½" gauge "Princess Marina," which is making good progress.

The Brighton "Baltic" Tanks.

My note about the Brighton "Baltic" tanks and their big cylinders, plus a mention of an exceptionally good performance by No. 332 of that ilk has brought forth a daffy of letters, some in confirmation, and others asserting that the engines were inferior to their later Southern confreres. To save a lot of direct correspondence I'll deal with the matter here. After the death of Mr. Stroudley, the Brighton loco. dept. struck a bad patch, and it was not until the appointment of Mr. Lawson Billinton that it made a recovery. Any Brighton driver who handled them, will confirm that his engines were good. It was one of the ten-wheeled express tanks, No. 23, that made the L.N.W.R. sit up and take notice. She took turns with a L.N.W.R. "Precursor" type 4-4-0, No. 7 "Titan," on the "Sunny South" through train; and the way in which the comparatively small tank engine ran between Rugby and Willesden without taking water, keeping to the L.N.W.R. express schedule with ease, was a source of great wonderment to the L.N.W.R. enginemen. Incidentally her opposite mate, poor old black "Titan," gained fame on the Brighton for the way she set the bank alight on every possible occasion! Anyway, it was No. 23's performances which led to the adoption of superheating and mechanical lubrication on the "Nor' West."

One of the L.B. "Moguls" distinguished itself by taking a test train of a hundred wagons and three brakes, from Norwood Jct. to Fratton; to the best of my knowledge and belief, this is the heaviest train that has ever worked over the tracks of any of the systems now constituting the Southern Railway. The six L.B. "Atlantics" 421 to 426 (big cylinder series) are among the fastest, most reliable, and lowest maintenance cost engines at present running on the S.R. The two 4-6-2 tanks "Abergavenny" and "Bessborough," and the "Baltic" tanks, did their stuff and made no bones about it. The first "Baltic," "Charles C. Macrae," had some centre-of-gravity trouble when she first took the road, but this was corrected, and the rest of the batch were O.K.

After the grouping came off, and it was decided to electrify the whole of the Brighton line, the maintenance of the Brighton engines was neglected, and naturally their performances suffered. The "Baltic" tanks were too big and heavy for the S.E. and C.R. section, even with the top works cut down to pass the loading gauge, which is smaller than the Brighton's; they didn't carry enough coal and water for long runs on the L.S.W. section, although my own private opinion is that they would have been darned fine on the Southampton boat trains, restored to pre-grouping trim, and—very important—*with their own drivers*. Long before the official announcement, it was known that their life as tank engines was to be ended, and consequently they were allowed to go, as you might say, "to wreck and ruin," and this will explain the lost-time log of an Eastbourne-Victoria run with one of them, sent me by a Leyland road-motor-coach fan. If his bus had been allowed to get into the same condition as the poor old locomotive, he would still be somewhere between Eastbourne and Victoria!!

You all know—no hot air intended—what my engines can do. Well, suppose one of them was handed over to a mechanic of the old school to work his sweet will on, and he altered the blast pipe and chimney, grate and ashpan, and fooled around with the valves and timing. There wouldn't be much (if any) monkey-gland serum left in it, and it would probably be as dead as ditchwater, or at least woolly, whilst the exhaust would, like as not, sound something like a cow with whooping-cough. Something similar has happened to the ex-Baltic tank engines. I've heard 'em puff in the old days, going out of London Bridge on the 5 o'clock and 5.5, and boy! did they mean business? I heard one puff in its present condition—and the difference made me feel like having a good cry. You who read these words can laugh—but locomotives *talk* to me with their beats, and that engine told me what was the matter with her.

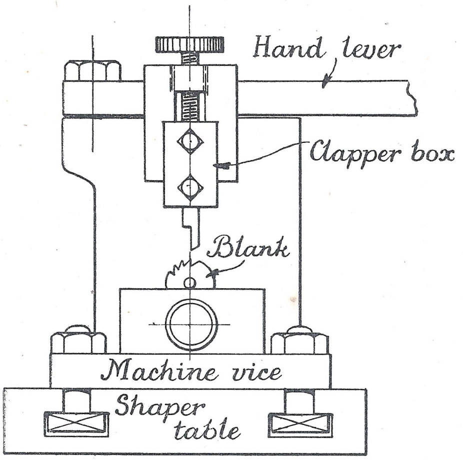
The engines as altered, have nothing like their original vim and energy, and nothing will convince any engineman who knows his job, that merely removing the side tanks and putting a tender on, could make such a difference. Being sick and tired of "dog-fight" controversies, I'm not going into detail here as to what has been done to the engines; I've got my own opinions, and I'll bet they are not far wrong. Writers in the semi-technical press have put forward various views and arguments about cylinder bore, grate area and so on, in an endeavour to prove that the engines are inferior in every way to more modern types. The fact remains, however, that in their original condition, with the same cylinders, grate area, etc., *and their own drivers*, they did the job and did it well. In their present condition, handled by drivers who are mostly prejudiced (naturally!) in favour of their own section's engines, the ex-Baltics are not the willing horses they used to be. Maybe they are homesick for their own bit of line—there's something in that!

Who "invented" it?

When anybody has a correspondence list as big as that of your humble servant, it is a million dollars to a pinch of snuff that many illustrations of the old saying "Great minds think alike" will make their appearance. I'll often get a letter from a brother describing some device or other, or some way of doing a job, which he fondly imagines is entirely original; yet maybe I've received particulars of a similar job or device two or three times previously from various sources, or have thought of it myself, or somebody else writes in later in the same strain. This is hardly to be wondered at, when you come to think of it, as steam locomotives have many points in common, though they differ in detail, and small copies necessarily "suffer from the same complaint." If a hundred copies of one

engine are made, even though the builders of those copies are scattered all over the world and do not know each other, it is safe to assume that many of the details will be identical.

The loose eccentric, for example, has been "invented" times without number. Although used on full sized engines in the time of the "Rocket," the late Mr. F. W. Webb not only



Simple way of cutting ratchet wheels on a Shaper———

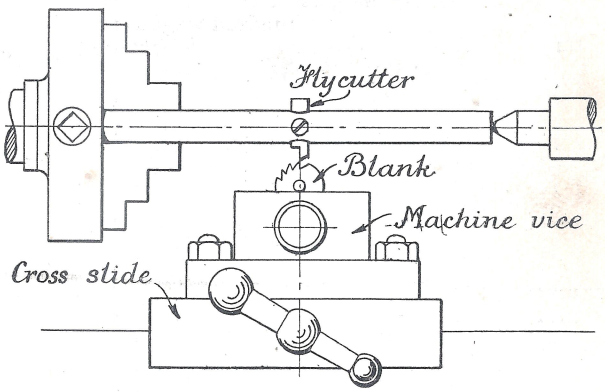
re-invented it, but got a patent for it, in 1889; whilst in small work it has been claimed by dozens of people. Likewise the "grasshopper" tender spring, in which a cast dummy leaf spring and axlebox, all in one piece, is suspended from the hanger brackets by two small spiral springs instead of rigid hangers. Similar grasshopper springs are familiar objects in Continental rolling stock, and were used on the Brighton "elevated" motor-coaches. There are dozens of such examples. If ever I describe any device, and know the *correct* origin of it, I never fail to give credit where due; a fact which has been remarked upon by many correspondents.

Here is another case to which I especially wish to draw attention. Back in 1924, I rebuilt and repaired several locomotives made by a Midland firm now "gone west." The projecting spindles of the tender buffers fouled the frames if any attempts were made to push the heads in, and so the buffers would not function. Now it was obvious to the rawest tyro, that the easiest way to get the buffers to work, was to alter the spindles so that they didn't project when the heads were pushed in; therefore, I drilled out the shanks and shortened the spindles. I then found that the springs took up such a lot of room in the buffer stocks, that the heads would not close right up, so again did the most natural thing in the world—drilled a recess for the spring in the head itself, same as was done in the self-contained full-size buffers made by an engineering firm, for converting "dumb" buffered wagons to spring type, after the former had been condemned by the Board of Trade.

I have used this type of buffer, on and off, for the last eleven years or so, *but never claimed the idea as my own*, as it was so obvious (being also used in full-size practice) that I was certain that dozens of other brothers had thought of the same wheeze in similar circumstances. If one hundred domestic kettles started leaking, one hundred brothers would promptly get busy with a soldering iron, and not one would claim that his idea of stopping a leaky kettle by soldering up the hole, was original. However, in reply to a request from somebody last September, I showed a sketch of the wheeze, simply saying I had used it successfully. Somebody else now comes along, says the idea is his own "copyright," and demands that I shall withdraw immediately any claim to it. If our worthy brother can explain *how the merry dickens I'm going to withdraw a claim I've never made* I'll be glad. Funny world, isn't it?

Other ways of making ratchet wheels.

A brother who has tried to file up a little ratchet wheel for a mechanical lubricator, says that the smallest file he has, leaves a little radius at the bottom of each tooth; consequently the pawls won't seat and the ratchet slips. He has an Adept shaper—can he cut ratchet wheels on this? Why, sure! Easiest thing in the world. Now you'll laugh when you read this, but as a matter of fact I cut the wheel for "Maisie's" lubricator on my planing machine, in a way which would give Inspector Meticulous forty fits. Like Mother Hubbard, I found lots of nothing when looking for a wheel (being a real prize crackpot, I often make oddments and give 'em all away) so parted a 1/16″ slice off a bit of ½″ axle steel which



———Ditto on a Lathe. (Note: feed *against* rotation of cutter.)

happened to have a No. 43 hole in the middle. I then poked a 3/32″ split pin through the hole, and put the blank in the vice on the planer, with the split pin resting on the jaws. There was a lathe parting tool in the clapper box, with which I'd been grooving something or other, as I yanked it out and ground it to a 60 degree angle. This was lowered on to the blank, and four movements of the table lever cut a tooth space 1/16″ deep. I then slacked the vice screw, moved the blank slightly around until the point of the tool came opposite the end of the cut space, tightened up again, and took another bite. This was repeated until I'd been right around the blank,

and the resulting ratchet wheel could not be distinguished from one made with a dividing head—a fitment I don't possess, but must get when I've saved up enough dough to finance the new Polar Route! Our brother can work the above ratchet-cutting wheeze in the same way on his Adept shaper. Ratchet wheels can also be cut with a fly cutter in the lathe, see sketch, which requires no explaining. Set the tool to cut full depth, feed very slowly with the cross slide, and use plenty of cutting oil.

A Model Launch-Type Engine.

A design suitable for the construction of either a working model or one for the show-case.

By J. N. MASKELYNE, A.I.Loco.E.

(*Continued from page 5*)

The Bedplate.

In its simplest form, this item consists merely of a slab of mild steel plate, 3/16 in. thick, as shown in our Supplement for January 2nd. Its construction provides a little exercise in sawing and filing, since the front and back edges must be cut away to form the lugs, two of which are required on each edge. It may be made from a piece of plate slightly larger than $3\frac{1}{2}$ in. × $4\frac{1}{4}$ in., and finished to $3\frac{1}{2}$ in. square, plus the four lugs. Each corner should be nicely rounded and

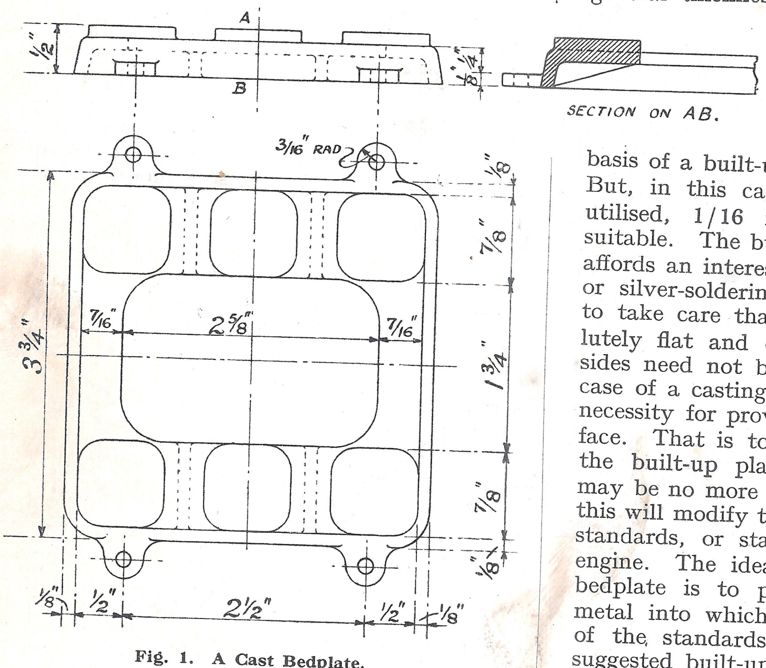


Fig. 1. A Cast Bedplate.

all sharp edges should be removed; and care should be taken to ensure that all four sides are exactly at right angles. The top surface must be perfectly flat, which may be achieved by means of grinding, or by scraping by hand.

A more elaborate bedplate, which may be either a casting or built up from sheet metal, is shown in Fig. 1, reproduced here. It is of usual type, and the dimensions are those it should have when it is finished. The pattern required for the casting presents no difficulty and is easily made. The casting may be in either iron or brass, and the only machining required is the spot-facing of the six bosses.

The drawing gives the main dimensions for such a cast bedplate, and the sectioned view is included to illustrate the strengthening webs underneath. These webs may be $\frac{1}{8}$ in. thick, and are shown dotted in the elevation and plan. Notice, also, that the sides are slightly sloped to facilitate casting. The general thickness of material is given consistently as $\frac{1}{8}$ in. throughout, and should be adhered to in the case of a casting.

The drawing, however, may be used as the basis of a built-up bedplate of the same type. But, in this case, thinner material may be utilised, 1/16 in. brass plate being very suitable. The building up of such a bedplate affords an interesting little exercise in brazing or silver-soldering; but the first essential is to take care that the material used is absolutely flat and of uniform thickness. The sides need not be sloped, as they are in the case of a casting, and there is no paramount necessity for providing bosses on the top surface. That is to say, if the total height of the built-up plate is $\frac{1}{2}$ in., the top plate may be no more than 1/16 in. thick; though this will modify the method of fixing the main standards, or stanchions, which support the engine. The idea of the bosses on the cast bedplate is to provide enough thickness of metal into which to screw the fixing screws of the standards; but in the case of the suggested built-up bedplate, the fixing of the standards may be by means of passing the fixing screws through plain holes in both the standards and the bedplate, and securing with washers, nuts and locknuts from underneath. Incidentally, hexagon-headed bolts and screws should be used wherever they are visible; they may be more expensive than "cheese-heads," but they more than offset their additional cost because of their greatly improved appearance, even in a model that is primarily intended for working.

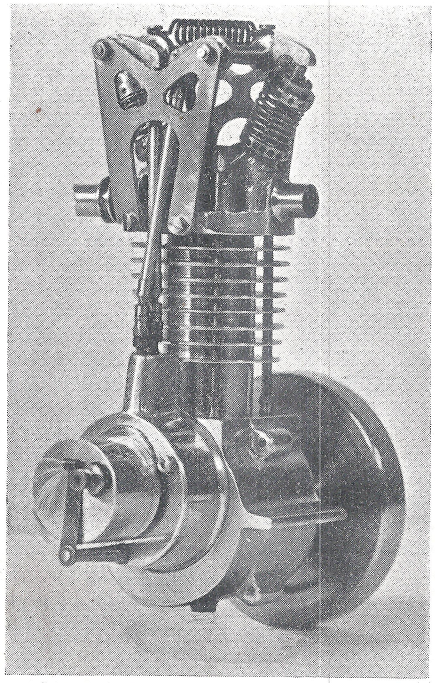
(To be continued.)

PETROL ENGINE TOPICS

A 7.2 cc. Four-Stroke Engine.

By EDGAR T. WESTBURY.

I MUST confess to a very deep-rooted suspicion of extremely tiny internal combustion engines. Many times I have been consulted by readers about proposed designs of engines of unusually small dimensions, and in general, my policy has been a repetition of the classic advice given by *Punch* to those about to get married—" Don't! " I hate to damp anyone's enthusiasm, but I have seen far more failures than successes in ventures of this kind. Some readers have reminded me that several very small engines have been constructed in recent years, and suggested that my excessive caution is quite unjustified. I would point out, however, that the tiny engines made by such people as the late Mr. F. Westmoreland are quite outstanding examples of model engineering, entirely apart from dimensions. They have been undertaken with a full understanding of the difficulties involved, and sufficient experience to guide the experimenter in surmounting them. Whenever I am asked for advice by anyone with whom I have no previous acquaintance, I assume that he is inexperienced; I do not know what equipment and mechanical skill he may possess, or whether he has that faculty, so valuable in all experimental work, of persevering when everything goes wrong, and bridging the gulf — generally very small—between failure and success. Anyone who starts off very enthusiastically to build his first engine, only to find that his labour has been all in vain, is liable to became rather disgusted with petrol engines, or even with all model engineering, and I have known one or two people who, in such circumstances, have given up trying to build engines entirely. Unreasonable, yes—but a very human failing, I am afraid.



Mr. H.L. Sharvell's 7.2 cc. inclined valve four-stroke engine.

However, I think that all attempts to build very small engines should be brought to the notice of readers, whether the ultimate result is successful or otherwise. It is well known that quite small engines have been produced commercially, but while interesting, these do not signify very much to the amateur constructor, because their manufacture is only rendered possible by modern facilities in engineering production methods, which as a general rule are not available to the home worker with very limited equipment. If any readers have attempted to build very tiny engines, I should be glad to have news of them, particularly the modest hero who informed me about two years ago that he was constructing a four-cylinder Diesel engine of $\frac{3}{8}$ in. bore by $\frac{1}{2}$ in. stroke, complete with scale model Bosch pump!

I was recently shown an engine which certainly falls within the ultra-miniature class in its dimensions, yet shows every promise of being a most successful working model. It is the work of Mr. H. L. Sharvell, of the South London Experimental and Power Boat Club, who is also a model petrol-driven aircraft enthusiast. He is, therefore, by no means a novice, but is, like many other model engineers whose work deserves publicity, very much inclined to shun the limelight; I have, however, managed to obtain from him a photo of his engine, and his permission to reproduce it.

The cylinder dimensions are $\frac{3}{4}$ in. bore by 1 in. stroke, and the cylinder barrel is machined from solid duralumin bar and fitted with a steel liner. It is secured by long column studs, which pass through holes in the cooling fins and also hold down the head. The latter is an aluminium casting, well finned, and fitted with valves inclined at 60° to each other, the seatings and guides of which are of bronze, shrunk in. The sparking plug boss is tapped to take a $\frac{3}{8}$ in. by 24 t.p.i. miniature plug. Valve operation is by means of rockers, carried by substantial side plates, and pivoting on bolts passing through the top corners of same. A tension spring, hooked between the two rockers, helps to relieve the valve springs of the work of returning the moving parts of the operating gear. The push rods are made of duralu-

min tubing with hardened steel inserts at the ends. The crankcase is of orthodox design for this type of engine, and is cast in light alloy, with separate timing case attached. A built-up crankshaft is fitted, running in bronze main bushes, and the connecting rod is cut from solid duralumin, with bronze bushed split big end, and bronze little end bush. The piston is machined from solid aluminium alloy, and is fitted with one piston ring.

As the main shaft journals are only 5/16 in. dia., it was considered that the orthodox method of fitting the flywheel to

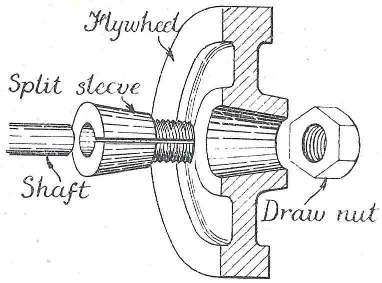


Fig. 1. How the flywheel is secured to parallel shaft.

the shaft, by means of a nut and taper, would unduly weaken the latter, and therefore the method shown in the sketch (Fig. 1) was adopted. As will be seen, it consists of a tapered sleeve, bored to fit the shaft, screwed at the small end, and split throughout its entire length. (Actually, the screwed portion did not require to be split.) The flywheel boss is bored to fit the taper of the sleeve, and when the parts are assembled, they constitute a form of split chuck, which can be drawn up by the nut to grip the shaft immovably. Total weight of engine, with flywheel fitted, is 1 lb. 5 oz.

Up to the time of writing, no particulars of the performance of this engine are available, but I am awaiting a report with interest, and judging from the workmanship and design, which are evident from inspection of the photo alone, I have no doubt as to its ultimate success.

An Air-Cooling Query.

Arising out of my notes on cooling in a recent article, a reader asks how to compute the area of cooling surface required for an engine producing a given horse power, of the four-stroke or two-stroke type respectively. Like most problems in experimental work, this one does not lend itself to a purely mathematical solution; any formula would have to be based on test data, which at present does not exist, so far as I am aware. Many readers feel disappointed that I, and other experimenters, cannot reach down ready-made formulæ from a shelf to suit their every requirement, but I assure them that reliable figures on which to base calculations for general design could only be obtained by years of test research on every type of engine. I consider it better to admit ignorance than attempt to give information which might prove misleading.

In any case, it would probably be extremely difficult to solve an air-cooling problem in definite terms, owing to the many variable factors. The first thing to find out would be the amount of heat which must be dissipated, and to do this, one must know, not only the thermal efficiency of the engine, but also the way in which the heat losses are distributed, i.e. how much of the total losses are accounted for by the exhaust gases, conduction to cylinder walls, etc. This will vary enormously in different types of engines, and with different port and ignition timing, fuels, etc.

Supposing that we can arrive at a definite figure in calories or B.T.U.'s per unit time, the next job is to find out how to radiate this away. The efficiencies of radiating surfaces differ vastly—I have not considered differences in the conductivity of metals, because I do not think that really affects the actual cooling efficiency. It is very desirable to use metals of high conductivity for the cylinder head, and also the walls; not because they improve the cooling, but because they help to transmit the temperature evenly through the whole body of metal, and avoid the distortion which is caused by *uneven* heating, a far more serious matter than mere high temperature.

While considering radiating efficiency, it is an interesting fact that many builders of excellent engines go to great pains to defeat their own ends in this respect. How often one sees a beautifully made engine, in which the finish extends to the polishing of the cylinder and head cooling fins; do the builders of these engines ever pause to recollect a very simple piece of apparatus called a Leslie's cube, which they learnt about (or should have done!) in elementary science class in their school days? A polished iron or steel surface is a bad enough radiator, but when polished aluminium is employed, matters are even worse. Everyone likes his engine to look nice, but a rough cast or sand blasted surface, finished with a thin coat of dull black enamel, is quite neat, and far more effective for radiating heat. If I may be allowed to digress for a moment, a recipe for cylinder black may not be out of place here.

Mix equal quantities of lamp black and domestic black lead, with sufficient japan gold size or copal varnish (preferably a little of each) to form a stiff cream. When the mixture is perfectly smooth and free from lumps, but not before, add sufficient turps. to form a thin paint, which must be applied sparingly to the cylinder after the latter has been cleaned of all traces of oil and grease. The surface is slightly crystalline when dry, and will stand any ordinary heat.

Spacing of Fins.

Another factor which affects radiating efficiency is the rate at which air can be brought in contact with the surface and carried away again. This, of course, is quite obvious; if air convection alone were relied upon, air cooling could only deal with very limited power. Thus the speed of the air past the cooling fins must be taken into account.

But one aspect of air circulating is not so obvious, and that is the effect of the depth and spacing of the fins.

Although every part of the finned surface is equally efficient as a radiator, the access of air to the surface to carry away heat may not be equal all over. If the fins are very deep, or very closely spaced, it is possible that air may not circulate to the root of them, unless a considerable velocity of draught is available. Then, again, the tips of the fins can only radiate heat conducted to them from the walls, and thus if they are made too thin, their conductivity is lowered. Aluminium is much better in this respect than iron or steel.

Both from the point of view of getting air well between the fins, and also conducting heat through the fins, they should be well tapered from root to tip, and join the cylinder wall with a fillet or radius. The common practice of machining fins with a square-nosed parting tool is definitely wrong. There is an ideal shape of fin, which has been carefully worked out to provide maximum thermal conductivity, published in Heldt's "Gasolene Automobiles," but it is not materially different to a straight taper of about 7 or 8 degrees included angle, which I generally employ on my own engines. (See Fig. 2.)

With all care taken in shaping the fins, I believe that it is possible to arrive at a stage where the increase of cooling surface, either by greater depth or closer spacing of fins, results in actually lowering the cooling efficiency, unless greater draught velocity is applied. The cooling of many modern aircraft engines is only rendered possible by the fact that the airspeed of the machines they are called upon to propel is much higher than it was a few years ago.

Many people are surprised by the fact that some engines which are obviously under-finned have put up rather remarkable high speed performances. If one thinks it over carefully, this is just the class of work—assuming, of course, that they are otherwise capable of delivering high power—in which such engines might be expected to excel. Another paradox!

Cooling of Two-stroke Engines.

The comparison of cooling efficiency in four-stroke and two-stroke engines is another matter in which there is more than meets the eye. Contrary to common belief, two-stroke engines do not require a greater area of cooling surface than four-strokes for a given power output per capacity. This has been actually demonstrated by bench tests of a large number of air-cooled motor-cycle engines, in which careful temperature measurements were taken. I believe that Messrs. Petter, Ltd., of Yeovil, made some similar comparison tests of large crude oil engines some years ago, and arrived at the same conclusion, though in this case water cooling was employed, which greatly facilitated calorimetric measurements.

The reason for this is not really far to seek. The heat wasted by any engine depends upon many factors, but assuming more or less equal thermal efficiencies, the heat generated depends on the amount of fuel actually burnt in the cylinder. Two-stroke engines of the usual type generally waste a certain proportion of their fuel by blowing it out of the exhaust port, but what remains can be very efficiently burnt if the engine is well designed. We are all familiar with crude and bad designs of two-stroke engines in which nearly all the heat is waste heat, but such engines would still be inefficient, even if their cylinders were packed in carbon dioxide snow. In normal two-stroke engines, the thermal efficiency of the fuel *actually consumed* is almost as high as in the best four-stroke engines, while there is very little time during the exhaust period for the gases to heat up the walls and head of the cylinder, as compared with one complete stroke of a four-stroke engine. Of course, the sparking plug has a rather trying time in a two-stroke engine, since it must fire twice as many times at a given speed, and is generally located so as to obtain very little benefit from the cool incoming charge. It is, however, possible to improve matters in this respect, to some extent, by careful cylinder head design.

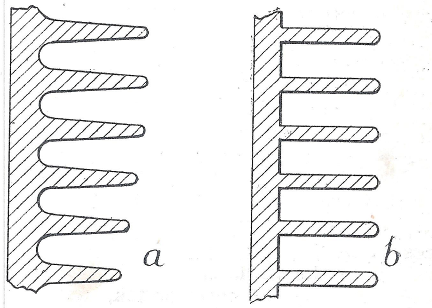


Fig. 2. Examples of (*a*) efficient and (*b*) inefficient cooling fins. It is usual to make the fins thinner than shown at (*a*) in small engines, to facilitate air circulation between them.

The symptoms of distress exhibited by many two-stroke engines when working at high capacity are due more to distortion of the piston and cylinder, causing gas leakage and increased mechanical friction, rather than to the actual temperature of these parts. For this reason, conductivity plays a great part in successful cooling, and anything which will promote it is worth studying. An aluminium "jacket" appears advantageous, but as there is bound to be some loss of conductivity where the liner makes contact with it, the ultimate benefit is somewhat doubtful. I find it desirable to use a rather heavy iron cylinder casting, and it is noteworthy that ultra-lightweight engines with extremely thin cylinder barrels generally suffer from serious distortion if they are called upon to work really hard, unless cooling conditions are very much improved.

I do not, however, advocate any slipshod cooling arrangements for two-stroke engines; on the contrary, more care expended in this direction would be well repaid, but improvements such as I have outlined, in increasing the radiating efficiency of available surface, are more to the point than crowding on too many fins. Most air-cooled two-strokes have some attempt at finning on the head, and

while this is very desirable, the cooling of the barrel is quite as important, especially in the region of the exhaust port. In four-strokes, the cooling of the head is of far more importance than that of the barrel; yet one very often sees engines with well finned cylinder barrels, and heads entirely devoid of fins!

The reason for this anomaly is very simple; it is *so* easy to turn fins on a plain circular casting, but not so easy to do so when the surface is disturbed by excresences, such as valve ports and bosses! This should never deter the designer from doing the job properly, however; simplicity is an extremely desirable feature in engine design, but should never be allowed to interfere with efficiency.

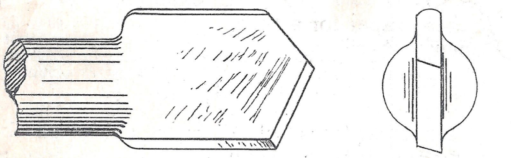
First Steps in Model Engineering.

Workshop Advice, Experience and Philosophy for Readers of all Ages.

By "INCHOMETER."

More About Drills.

My friend, "Old Millwright," who has sent a wealth of very interesting matter relating to old time ironworks and collieries, besides valuable opinions about cutting tools, recently favoured me with a communication offering some advice and comment upon drills. Coming from one who is very experienced in engineering, workshop practice, and appliances, this letter determines me to publish it in full, thus it will afford to you more benefit than if in any way shortened. Forgive me "Old Millwright" that I have not posted you an acknowledgment of your favours. In due course you will hear from me direct, and with the press cuttings you desire to have returned. Other of the matters will be helpful to my articles, I am keeping them in reserve, and with appreciation of their practical nature. My reversion to the subject of drills and drilling is stimulated by the letter from H.W.S., published on page 627 of THE MODEL ENGINEER of December 26th last



From a sketch sent by "Old Millwright" in conjunction with his letter.

year. In conjunction with the information given on the matter of grinding drills, in "First Steps," this letter and that from "Old Millwright" are very opposite qualifications and justify my continuation of the subject. Herewith is the comment given by the last mentioned.

"The observations of your correspondent (Mr. Fox?) require a good deal of qualification, if he grinds his drills with an included angle of about 60 deg. as shown, then he must keep the intersection of the cutting lips central. I think that this angle decides whether a drill will cut tight or easy, in any case, if I desire a straight, round and standard hole, then I invariably use a straight fluted drill, ground a 'foot' off the centre, so that only one lip cuts. You will, perhaps, recall the old 'rubbing drill' once used for cleaning out cored holes, and how these were always tight to size. Then in boring out those cheap Belgian air guns, the hole 18″ long by about .3 mm. is always made by a straight fluted drill, ground a long way off the centre. As a shot, I should say that a twist drill with an included angle of less than 130 deg. will cut large, but if greater, then it will make tight holes, a few degrees less will suffice for flat and straight fluted drills."

Drills are essential in mechanical work, I am sure that my space is well devoted in presenting information about them. More about the subject will be gratefully received.

Screwing with Solid Dies.

At the moment of writing, near to the passing of the old year, I am perturbed by reflection as to whether "First Steps" really meets with general satisfaction and really has been useful throughout the course. Akin to this is some indecision as to the selection of matter which will properly fit in with the title. In one of his, always kindly, letters, "Old Millwright" thinks that I have, in one respect, gone beyond the resources of my readers who are of the home mechanic circle. Another has urged me to consider and write for the "kindergarten" mechanics; one critic expected me to describe methods and matter of latest tool room and tool maker grade. Now, to cheer my thoughts, has come a letter, and all the way from Upper Assam, India, and synchronising with my talk about domestic engineering. The writer advises me that "I have been reading your articles under 'First Steps' in Model Engineering with very great pleasure. I do a little work in this line myself, but most of my work is more on general engineering lines; in my work one must know a little about all trades, from building iron houses to running electric plants." Well, well, here is one who tackles construction of iron houses and manages dynamos and electric motors on a tea estate, yet reads "First Steps" and, "with very great pleasure." Thank you Mr. Correspondent for so kindly expressing an indication that my "First Steps" effort through 1935 has been worth while. It shall be a means of stimulating me to a hopeful New Year's start, and for this I will endeavour to help you about your difficulty in screwing with hand dies, first stating the case with your own words, as follows: "But I have found trouble when using the solid die, and that is, in not getting a true screw; it so often happens that the screw, when finished, especially in brass, is not running true with the metal, in other words the screw is deeper on one side than the other." Hand screwing with dies is explained in "First Steps" of January 24th, 1925, my correspondent will probably find some help from this article. Presumably he means that his dies are one piece dies as

distinct from the kind made as two pieces and which are closed together upon the rod by means of a tightening screw. Examine any one of the dies and notice that the threaded hole tapers for a short distance; this tapered or conical part is to be applied to the end of the rod to be screwed. But this end of the rod must be bevelled or coned for a short distance and to a taper which fits the taper in the die. You should not attempt to apply the die to an end of rod which is not tapered. In the article to which I have referred, Fig. 7 shows a rod thus prepared for being screwed. The taper should be turned in a lathe so that it is concentric with the plain part of the rod. Unless the mandrel of the lathe is hollow, the turning cannot be done upon a rod of greater length than will go between the extreme span of centres. You will then have to get the taper by filing, and carefully, so that it is concentric with the plain part of the rod. When applying the die, be sure that it is level and square with the axis of the rod, use care when rotating it to cut the screw, manipulate the effort and pressure so that a general even effect is given. There is an art in using hand screwing tackle, it can only be acquired by practice, it needs a cultivated delicacy of touch so that one senses by instinct just how a die or a screw tap is cutting. Even with this, to obtain a concentricity and thread equal or approaching near to that given by a machine is difficult, almost governed by chance. There are makers of such screwing tackle provided with circular guides to the dies, a plain hole in the guide fits upon the rod and ensures concentricity of the cut screw. A suggestion, perhaps the rods are not truly round, the trouble may be due to this. When a die is in new condition and is keen cutting, it may be used upon a rod of actual diameter size. But when the cutting edges have become dulled by use, the metal, especially softer metals such as brass, copper and wrought iron, is squeezed as well as cut by the die. The usual practice then is to reduce the diameter of the rod below its nominal size in order to allow for this squeezing up effect. The amount of reduction to allow depends upon size, metal, and condition of the die, it is determined by judgment based upon experience. If too much reduction, the screw thread does not finish to size, if not enough, the tops of the thread are liable to be torn and the die become choked.

Model Engineering Aboard Ship.

Amongst my intimate friends is a sea-going chief engineer who, during years and years, manages to continue his hobby of model engineering and mechanical work whilst voyaging from port to port, and when his ship is in harbour. A pleasure I look forward to, and cherish, is to visit him and spend an hour or so in his cabin, have a cup of tea, smoke my pipe and talk about models and the hobby work he has in progress at the moment. Quite an interesting little yarn could be spun about his "aboard ship" model engineering and the wonderful making he contrives to do with few tools, and under difficulties for obtaining material and supplies. Having tried to give encouragement to home workers in similar circumstances of limitation, I will give them a New Year hearten by quoting from a letter he has sent me from Gardia in East Spain; "Work is very difficult aboard a ship stuck out here, no shops, and I must rely entirely on what I can find aboard, both for material and tools. Some of the oddest things have to be pressed into service, for example, a wire nail turned taper for a broach and case-hardened to open out one hole only. It all takes time, but as it is a hobby, and I am not working to a price, I don't mind."

Notes on Piano Overhauling.

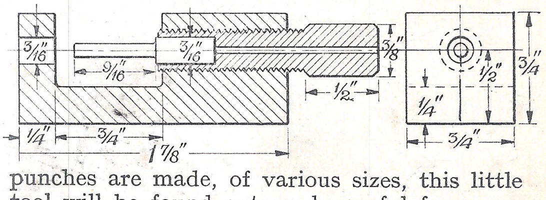
By F. G. MORRIS.

Although an unusual subject, a few remarks on the overhauling of a piano action may be of interest to some readers of the "M.E.," more especially if, as in the writer's case, the job is successfully completed at the cost of less pence than guineas would have been charged, had the job been done professionally.

Most pianos, when kept in a room which is only heated occasionally, give trouble through the hammers sticking. These hammers are pivoted on small tinned brass pins, turning in felt bushes which are pressed into the wooden hammers. In a damp atmosphere, the wood and felt bushes swell slightly, causing the hammers to stick. The remedy is to remove the pins, and enlarge the holes in the felt bushes until the hammers can move freely without any side play.

On commencing the job, it was found impossible to remove the small pivot pins with a direct push, so the small tool illustrated was constructed. The body is of mild steel, the groove being milled square with the 5/16″ B.S.T. tapped hole. A 3/16″ hole is drilled in line with the screw, to allow the pins to be pushed out.

The screw is also mild steel, being threaded a good fit for the tapped hole. A 3/16″ hole is drilled as shown, and also a 5/64″ hole for removing the punches from the screw. The punch is of silver steel, hardened and tempered to a deep straw colour. If a number of these



punches are made, of various sizes, this little tool will be found extremely useful for many similar jobs. Having removed the brass pins, the holes in the felt bushes were enlarged with a "D" bit reamer .001″ larger than the pins.

After cleaning and replacing the piano action, the job was found to be a great success, the total cost being one penny for a piece of silver steel for the reamer, the rest was made from scrap.

Giants of the Power-House.

Some interesting facts about the giant turbo-electric plants which form so characteristic a feature of modern power stations.

WHILE the majority of our readers are more actively concerned with the construction of power plants in miniature, it is not without interest to pause for a moment and take stock of the race of engineering giants who are slowly but surely dominating the power houses of the real engineering world. To anyone who has been accustomed to visit an engine room where the reciprocating engine has been the central figure, the appearance of a turbine power house is a revelation. In place of the flashing brightness of moving piston-rods, cross-heads, and cranks, and the more subdued but still arresting oscillations of valve gears and pump levers, there is an air of stillness and secrecy. There is little to be seen but huge pipes and the casings of the turbines, and little to be heard but the quiet hum of well-balanced rotors and armatures in high speed revolution. By courtesy of the British Thomson-Houston Co., Ltd., of Rugby, we are enabled to give our readers a peep, in the accompanying photographs, at some of these silent giants of the modern power house.

Enormous Power Plants.

During the past year the BTH. Company has completed the manufacture of the 50,000 kw. 2-cylinder turbo-alternator for the Ironbridge Generating Station of the West Midland Joint Electricity Authority, the alternator for which is wound for 33,000 volts. The turbine operates at a steam pressure of 375 lb. per sq. inch gauge at the stop valve, and a total steam temperature of 750 degrees F. The turbine exhausts into a vacuum of 28.9″ of mercury at 50,000 kw. load, and the feed water is heated by steam extracted from the turbine to a temperature of 315 degrees F.

The BTH. have also in course of manufacture a 51,600 kw. machine for the Kearsley Power Station of the Lancashire Electric Power Co. The turbine runs at 1,500 r.p.m., and is of the 2-cylinder type designed to operate at a steam pressure of 600 lb. per square inch gauge, and a total temperature of 800 degrees F. The alternator of this set is also wound for 33,000 A third BTH. 75,000 kw. turbo-alternator is being built for the Barking Power Station of the County of London Electric Supply Co., Ltd.

Another interesting plant we are able to illustrate is the BTH. 30,000 kw., 3-cylinder extraction type turbo-alternator at the Dagenham Works of the Ford Motor Co., which continues to give good service. The turbine operates at an initial pressure of 1,200 lb. per square inch gauge, with a total steam temperature of 725 degrees F.

These enormous power plants illustrate only one side of the many activities of the British Thomson-Houston Company. At the other end of the production scale, the merits of their small electric motors, their transformers, and their radio and sound equipment are well known to our readers. In these lighter branches of manufacture, research is constantly proceeding with a view to the production of new designs and improved efficiency.

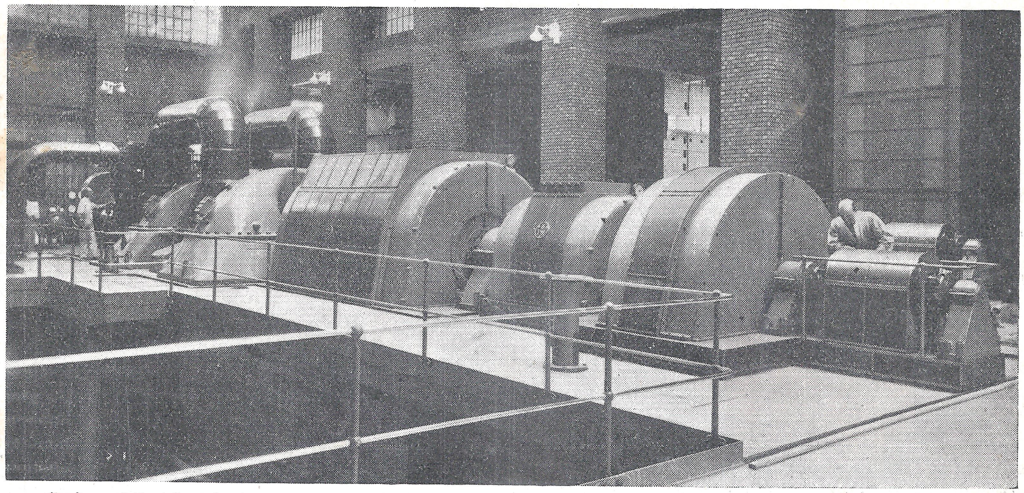
Discharge Lamps and Vacuum Tubes.

During the past year a great deal of important work has been done on electric discharge lamps and vacuum tubes, the high efficiencies of the former opening up several fascinating fields of advancement. It is interesting to note that Mazda Mercra lamps are now in use in all parts of the country on many miles of roads and under various other conditions of service. Research on thyratrons and rectifiers, and photo-electric cells has continued, while investigation of the characteristics and properties of cathode ray tubes for television purposes has been carried out. In connection with television, much interesting work has been done, and a complete picture scanner (with sound) has been made. The chemical and metallurgical section of the laboratory has conducted extensive investigation on the properties of various materials, while in connection with insulations, research work has been done on synthetic resins, varnishes and moulding powders.

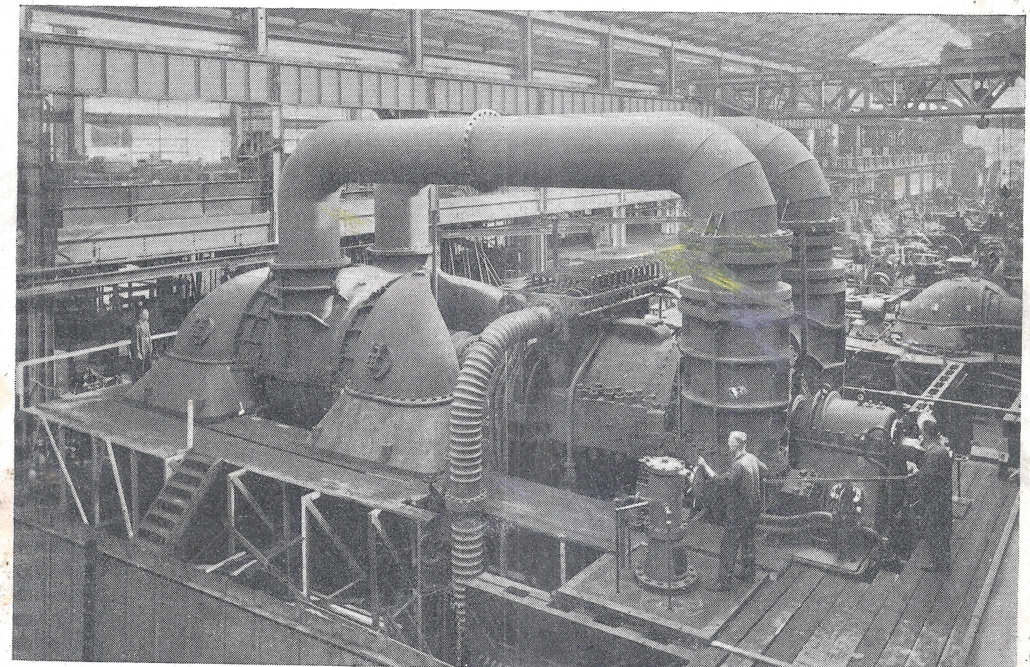
Cinema Equipment Developments.

Several important developments in cinema and sound amplifying equipment have also been made. A new picture projector mechanism has been introduced for the smaller cinemas, designed to work in conjunction with the new BTH. low intensity lantern. The latter is of the mirror arc pattern, in which the light system makes use of a mirror having two fixed focal points, the arc crater, and the picture gate. The equipment is designed to operate at current values between 20 and 50 amperes, and 60 to 100 volts d.c. It is suitable for throws up to 100 feet. A high intensity arc lantern of the same type has also been developed, and with the normal current consumption of 50/75 amperes, the screen illumination compares very favourably with that of other types consuming up to 140 amperes.

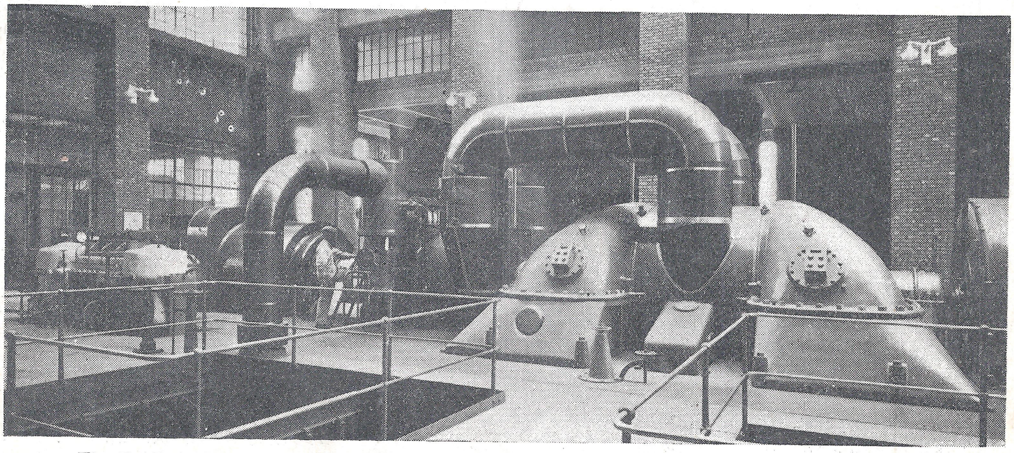
A new spot and slide projector which combines in one unit a highly efficient projector and attachments for slide projection, spot-lighting, floodlighting, and for colour mixing and colour wheel work, has been introduced. The lantern is designed to operate between 20 and 50 amperes at 60/100 line volts. Two further models of hot cathode rectifiers for cinema arc supply have been constructed. Continued loudspeaker development has resulted in a greatly improved speaker arrangement for cinema use.



A view of the electrical end of the BTH. 30,000 kw. turbo-alternator at Ford Motor Co.'s Dagenham Works.



The 50,000 kw. turbo-alternator for Ironbridge Generating Station of the West Midland Joint Electricity Authority under construction in the BTH. Rugby Works.



The BTH. 30,000 kw. turbo-alternator installed at the Ford Motor Co.'s Works, Dagenham.

Model Locomotive Efficiency and Performance.

A Plea for the Institution of an Official Testing Apparatus.

By G. S. WILLOUGHBY.

I READ with considerable interest the letters of " B.H.P." in the " M.E." for Oct. 17th, and also his later letter in the " M.E." of Nov. 21st, *re* " Model Loco. Standards of Performance." I have given both these letters most careful consideration, and have come firmly to the conclusion that there is a very great deal of truth in " B.H.P's." arguments.

I myself have long ago wearied of seeing and reading about model locomotives staggering along with prodigious loads for very short periods on limited lengths of track, as often as not slipping intermittently the whole time.

Such tests prove nothing in particular, except that the model steam loco. is capable of standing being grossly overloaded for short periods.

Almost any old full size locomotive would put up a similarly " marvellous performance " under like conditions. Even if the track is a continuous one, it is impossible to state definitely that a model loco. is working in the best and most efficient manner; sitting behind a model locomotive driving it at speed on a track, is not a suitable place for arriving at accurate data as to its efficiency or otherwise.

Readers may say—" My model loco. must be right, it will do so many laps at such and such a speed and the boiler pressure is maintained indefinitely." All very good, but I say, how do you know that your engine does not suffer from such common defects as wire-drawing due to the steam pipes and regulator ports being too small, back pressure due to faulty port design, and the use of ridiculously small exhaust outlets, etc.

Bad design of valve gear giving faulty steam distribution; you may say that the beat is perfect, but there are reasons why it is not always possible to judge the perfection of a valve gear by the beat of the exhaust. For instance, the suspension of the expansion links may be faulty and in the wrong position; making the cut off at one end of the cylinders very different from that at the other end of same, and yet the beat may be apparently perfect to the ear. Can you *prove* that the cylinders of your model loco. *are* developing all the power of which their size should render them capable?

In other words, will your locomotive give a tractive effort in practice, of anywhere near to its theoretical one? Some readers will probably say that all the points which I have raised are too abstruse and theoretical to be worthy of attention; and that their engines do all that is required on the track, which is all that matters. That is the whole reason of this article, model locomotive design has arrived at an impasse or dead end simply due to this attitude—the breed is not being improved commensurably with the improvements taking place in full size work, and it is for that reason that I so heartily approve of B.H.P's. suggestion of a proper testing stand for model locomotives.

Unless I am completely mis-informed, the L.N.E.R. locomotive department *did* learn some very valuable lessons from the testing of the " Cock-o'-the-North " on the testing stand at Vitry—some of them not altogether expected.

Model locomotive engineers have infinitely more to learn or unlearn from such tests, and some of these lessons will be bitter pills to swallow, but swallow them we must, if we are really to improve our methods and the efficiency of our model locomotives.

Just to show what can be done by testing stand conditions, I would mention the tests carried out by the Dunlop Tyre Co., at their works, on the tyres for Sir Malcolm Campbell's " Blue Bird " car. The Dunlop Co., made a special tyre testing machine which reproduced the conditions under which the tyres would run at Salt Lake so perfectly, that both they and Sir Malcolm knew to a fraction, what these tyres would stand on the actual record breaking run. Why cannot the same sort of thing be done for model locomotives?

A properly designed and made testing stand for model locos. is the ideal method of proving faulty design or workmanship, or the reverse.

An apparatus of this kind could, for instance, be made to show up such defects as wire-drawing due to serious discrepancies in relative areas, back pressure, faulty valve gear design and lay-out, bad balancing, excessive wheel slipping due to cylinders being too large for the adhesive weight, maximum brake horse power, coal and water consumption, etc., etc., in fact the apparatus could be designed to reproduce practically all track conditions from the worst to the best, and the data could be obtained infinitely more accurately and comfortably than by any track tests.

Now the question arises as to who is capable of designing and making such an apparatus?

Well! the writer has a very shrewd suspicion as to the identity of " B.H.P." He is I believe a gentleman experienced in B.H.P. tests in another sphere of model work, and is also a member of the S.M.E.E. I would suggest, therefore, that what could be more suitable than that the oldest and best known of the model engineering societies, viz., the S.M.E.E. should undertake the designing and making of this apparatus.

Might I also tentatively suggest that the combined brains and abilities of the following members of the S.M.E.E. could evolve something really good in model locomotive testing apparatus:—W. B. Hart, M.I.M.E., C. M. Keiller, L. M. G. Ferreira, M.I.E.E., H. Greenly, A.I.Loco.E., J. A. B. Graham, and " B.H.P."

All these model engineers have special qualifications for a job of this kind, and Mr. Greenly, I believe, designed such an apparatus for testing the Romney, Hythe and Dymchurch Railway locomotives.

One difficulty which arises is that of the various gauges of different scales of locomotives, so that it might be necessary to make two machines, one for engines of ½″ scale to ¾″ scale, and another for engines of 1″ scale to 1½″ scale; larger than this it would not be necessar y to go, as the data obtained from the other sizes would be sufficient for 2″ scale engines.

I would suggest also to the S.M.E.E. tha they could gradually recoup themselves of the expense incurred in making this apparatus, by offering to test any model locomotive foı a fee, giving a proper certificate of its merits and defects.

The owner of a locomotive which held a first-class certificate signed by the S.M.E.E. would find it a great asset if he wished to sell the engine, and also anybody who had very poor track facilities would be enabled to get a true idea of his locomotives' capabilities.

Finally it must not be thought that I am against proper track tests, but the tests on the testing stand should come first, and be followed by the track tests afterwards, when the engine is passed as satisfactory on the testing stand.

Let us bring some scientific methods to bear on model loco. design for a change. The testing stand will jerk us out of the rut of self complacency and stagnation.

Some Experiences with "Conversion."

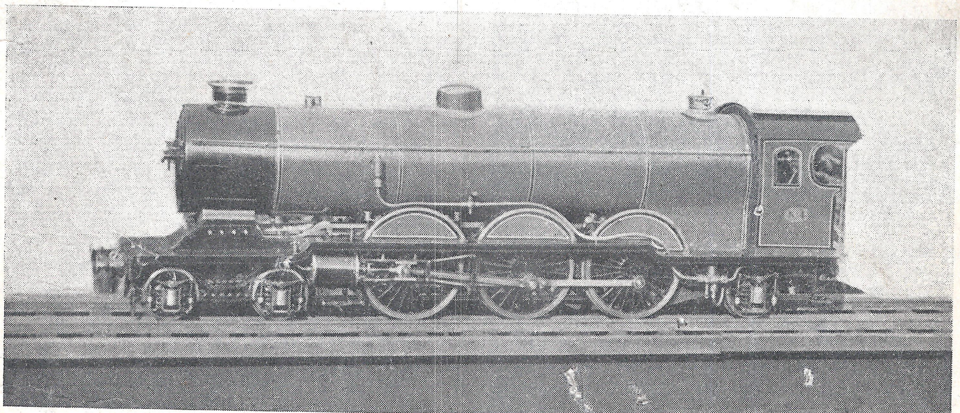
By W. C. HENNING (South Africa).

RECENTLY having had the privilege of driving Mr. J. C. Crebbin's 4-cylinder high pressure locomotive "Conversion," it occurred to me that readers may be interested in some observations made at the time by a South African reader. It is hardly necessary for me to explain that Mr. Crebbin, familiarly known as Uncle Jim, is a pioneer of the model locomotive world, and an expert in railway and locomotive matters in general. The results of his vast experience gained over a period of 50 years, all seem very obvious when explained by him, but I believe it is the obvious which escapes most of us when we are searching for that elusive combination of success and simplicity in our endeavours as model locomotive engineers. In view of this, I obtained Mr. Crebbin's permission to recount in this article, some of the valuable advice and information he gave me. To drive his engine "Conversion," is to realise that his ideas in connection with the model steam locomotive are valuable and essential to success.

The following are the leading dimensions of "Conversion." (It is interesting to note that the engine was first constructed in 1907 as a four-cylinder compound, and rebuilt recently as a four-cylinder simple.)

Scale ¾ ins. to 1 foot.—Type 4-6-2.
Cylinders (four) 1 inch diameter.—Stroke 1¼″ outside cylinders, stroke 1½″ inside cylinders.
Diameter of driving wheels 4⅝ ins.
Valves (slide) travel full gear.—⅜ inch.
Port openings ⅛″ steam, ¼″ exhaust.
Lead.—Port opening occurs on dead centre.
Lap.—1/16″.
Exhaust.—Line and line.
Diameter of boiler.—4½ inches.
Grate area of firebox.—17 sq. inches.
Flue tubes.—Nine ⅝ ins. diameter, two ¾″ diameter.
Superheater tubes.—Four ins. diameter stainless steel.
Boiler pressure.—80 lbs. per sq. inch.
Weight of engine in working order.—84 lbs.
Gauge.—4½ inches.

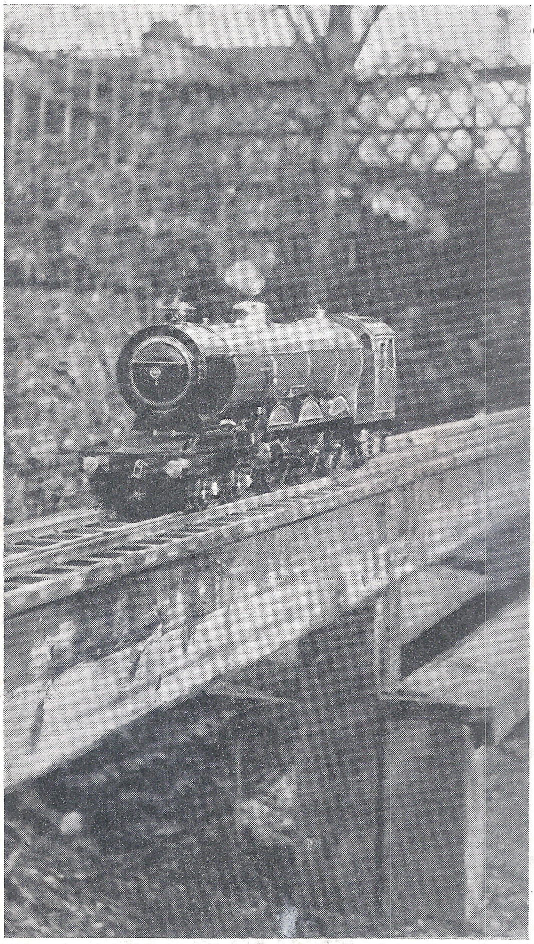
This latter item of gauge is also interesting. Actually ¾″ scale requires 3½ inches gauge, but Mr. Crebbin has adopted 4½ inches with the great advantage of increased width between frames and increased stability, without detracting from appearance or becoming too obvious, as will be seen in the photographs.



Mr. J. C. Crebbin's 4-cylinder Sim ple Locomotive "Conversion."

Perhaps my impressions of driving this engine may be interesting. "Conversion" has astonishing acceleration, and the amount of work she will do with practically no steam is a mystery to me. Giving her the merest whiff of steam caused "Conversion" to glide away with 3 passengers in a manner which is best

described by the motor car advertisement term "Silky Smoothness." Steadily, the engine accelerated with each barely perceptible exhaust beat, and linking up, apart from making the exhaust even less audible, had no effect on the acceleration or smooth running of the loco. The slightest increase in throttle opening caused immediate response, and bore testimony to the remarkable free running qualities of the engine. I found this sort of thing very absorbing, and could not help thinking that the extra work entailed on a four crank engine is amply justified when results like this attend the effort. However, Mr. Crebbin put a stop to these ruminations by



"Conversion" on the Track.

telling me to open her out and put her through her paces. Half throttle caused her ladyship to leap forward, and linking up had no retarding effect, even at practically mid-gear, and after gaining sufficient confidence, I was foolish enough to "Give her the lot." I was prepared for the bullet like acceleration which followed, but in my intense enjoyment of the speed which I would estimate at 15 m.p.h. (it seemed nearer 150 on the track) I failed to shut off soon enough, and had the humiliation of connecting rather violently with the buffer stops, in spite of the trolley brakes being hard on—with locked wheels, I presume. Mr. Crebbin carried out a drawbar test, and explained how very useful this test is in judging the results of adjustments, etc. The engine is coupled to the trolley with an ordinary hand spring balance, in place of the usual coupling, and when the engine has reached her stride the trolley brake is applied steadily, and the throttle and link adjusted to give the best results on the spring balance.

"Conversion" registered 24 lbs. steady pull without fuss or slipping. The points stressed by Mr. Crebbin were as follows :—

The weight of engines built to $\frac{3}{4}''$ scale range between 60 and 100 lbs., and for that reason the larger scales are regarded as too cumbersome. Smaller engines, on the other hand, lack reserve and consequently require more attention.

Superheating.

This is even more essential in a model than in real practice. The use of large ports and good distribution arrangements in the cylinders becomes negatived if wiredrawing exists in the steam pipes, as was the case when first rebuilt. This condition may easily arise with the use of small bore superheater tubes, and consequently Mr. Crebbin has now fitted a large port regulator and large bore superheater tubes. This method consists of taking two solid drawn rustless steel tubes, $\frac{1}{4}''$ diameter from the smokebox header, each tube accommodated separately in a fire tube and taken to a header in the back of firebox. From this firebox header two similar tubes are brought back through separate fire tubes to the cylinders. The tubes are screwed 40 threads to the inch, into the firebox header which is of square section and also made of rustless steel. Apart from avoiding wiredrawing, these large bore tubes so reduce the velocity of the steam that it has ample time, not only to be dried but actually superheated.

Brick-arch.

Mr. Crebbin employs a brick-arch, which he has found reduces smoke to a minimum, in other words, aids complete combustion, and avoids bird-nesting. Actually, bricks find no place in the construction of this arch. It consists of a piece of iron plate 3/32″ thick bent to form the arch and fit between sides of firebox. Holes are punched in the plate to help the bonding of Pyruma paste, which is applied as a coating after the plate has been fitted into position.

Lubrication of Four Cylinders.

One is naturally inclined to doubt the possibility of lubricating each of four cylinders equally from a single plunger pump. "Conversion" is similarly fitted, and the oil is delivered by a single pipe to a four way branch to each cylinder, with entirely satisfactory results. Faulty lubrication would soon become evident with "Conversion's" superheat. A non-return valve is, of course, fitted to each oil pipe at the cylinder.

Springing.

When I remarked upon the total absence of slipping with "Conversion," Mr. Crebbin invited me to feel the springing. I was surprised at the tenderness, a sort of "bouncing boy" effect.

In conclusion, I would like to thank Mr. Crebbin for the above information, which I feel sure, will enable some of us to view our problems from a wider angle and assist us in getting better results from our locos.

WORKSHOP TOPICS

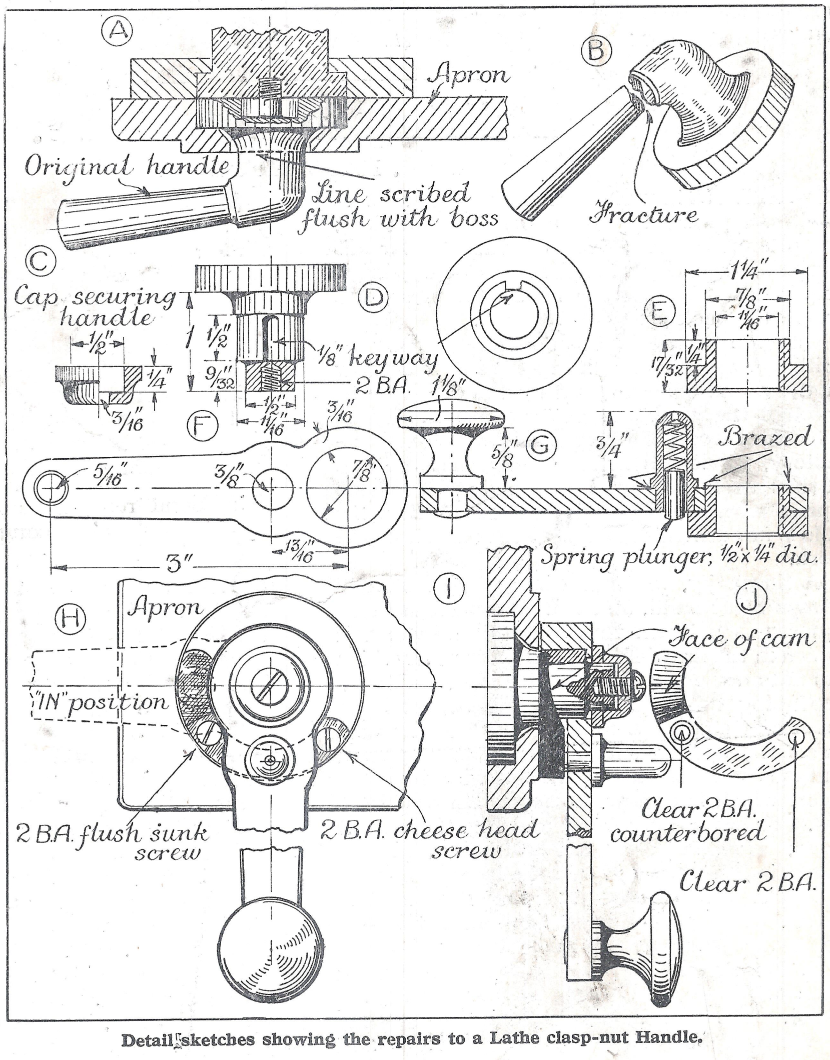
Repairs to an "Eta" Lathe Clasp-nut Handle.

By H. DYER.

READERS who are the fortunate possessors of "Eta" lathes, may have noticed that after many years' use the clasp nut has a tendency to drop out of gear at a very inconvenient moment. Being *in gear* when the lever or handle is *horizontal*, wear causes this tendency to drop down, the weight of the handle, little though it is, being quite sufficient to overcome any little friction which may remain.

The writer had to resort to a short piece of leather belt lace tied between the end of handle and the cross slide screw bracket for quite a while, meaning always to effect an alteration to this lever, until finally, the latter having *stuck up* instead of dropping, a fracture occurred when, in desperation, it was smartly rapped with a spanner. The resultant position of this fracture is shown in sketch B, and it simply saved the writer the trouble of cutting it off with a hack saw as had been his original intention when the contemplated repair was to have been done. Sketch A shows a section (on plan) of apron, nut box, nut and lever, and B the lever removed:—take off nut box and the lever or handle comes out backwards.

D shows the camplate machined from the original B. Simply grip the circular plate in s.c. chuck and machine to dimensions shown, turning back to dotted line shown in A and cutting the 1/8" featherway, either at same setting in lathe, or finally doing it in shaper or miller. Tap the end out 2BA by 1/4" deep. The cap securing handle C is simply off a 7/8" bar of B.D.M.S., and fits snugly over the 1/2" portion of D. Drill out the end 3/16" diameter to clear 2BA screw in D. The handle F is of 1/4" B.D.M.S. plate or flat rod. Cut and file to the shape shown, and braze into it the ferrule shown in at E, together with the little plunger cap shown in G, which gives the whole handle assembled with plunger, spring, and all the doings. H is a front view of the apron, showing the location of the writer's *anti-drop-out camplate*, whilst I is an endwise section of same, in which the camplate is shaded black. When in the IN position, and the lever or handle is horizontal, the little plunger bears upon the ramp face of cam, and precludes any tendency for the handle to come "un-put" at the wrong moment, the internal spring maintaining quite a nice pressure, whilst the 3" lever and ample (though far from unsightly) knob gives one plenty of leverage to release.



Detail sketches showing the repairs to a Lathe clasp-nut Handle.

In re-viewing the sketches and constructional

notes, the writer can find no reason to elaborate them, as the job is very simple, and requires no kit save its own parent machine, and in using it thus, the saddle may be located in position by interposing a strip of wood on the bed between the former and the tailstock, locking the latter in position where desired.

The cam is of course casehardened, as is also the countersunk screw and the cheese head stop screw. Of course, this casehardening is done *after* the fitting, the cam being removed specially for this process. The countersunk screw is fitted on the bench. The stop screw hole had better be drilled and tapped in position on the lathe, with the handle in such position as will give adequate clearance for lead screw when using quick traverse. Again, to avoid any chance of a snag, see that the tapping position for 2BA stop screw is correct relative to the head of same when performing its office as *stop* when in contact with lever or handle as shown in H. May it be said in passing that since 1924 this is the only alteration performed to this lathe due to wear. Since purchased new in that year, the bearings have only been taken up a fraction of a turn on each of three occasions, and will only take the very finest of machine oil. Being no lover of the "whopping cut" fetish, the writer nevertheless has reduced ½" B.D.M.S. to nothing in one cut at a speed of approx. 600 r.p.m., the stock projecting some 2½" from chuck and using no suds—and experiencing no chatter—if the saddle is locked in position. This latter is the cause of a lot of so called chatter. How can one expect a tool to cut without vibration when taking a big bite when there's no "mass" in the saddle to keep it from creeping back as you feed the top slide in? Shove in your clasp nut if using top slide. If using power traverse, the power is directly on the saddle, so keep the top slide reasonably tight, keep the tool really sharp and correct, and a lot of chatter will vanish.

Drilling in the Lathe.

By F. HALL BRAMLEY.

DRILLING in the lathe is not a very satisfactory procedure from many points of view; but often it is convenient to use the lathe for this purpose, especially when some heavy drilling is required, too big for the light drill press, and where the back gear can be used.

The use of the back poppet headstock for drilling very often results in the internal taper of the barrel being injured by the drill coming through the work and cutting into it. Using a block of wood to prevent this is also unsatisfactory, for it has little hold against the end of the barrel, and cannot be relied upon to keep square with the drill, with the result that the hole is not drilled square with the surface of the work.

A simple jig, which can be easily made, will always be at hand, and will always ensure true squareness between the drill and the work, is shown in the drawing. It is a sliding rest which lies flat on the ways of the lathe bed, and has a depending tongue A, which fits between the ways and acts as a guide. The upright part forms the upright surface for drilling against, and it is strengthened at the back by the angle piece, which is cast with the rest in cast iron. Fig. 1 shows the side view, and Fig. 2 the front view; while half front and half back views are shown in Figs. 3 and 4. At the back is inserted a centre, which enters the poppet headstock barrel. This centre is screwed into the rest up to the shoulder, and riveted over.

In making the jig, the pattern will be the same shape as the casting and as in Figs. 3 and 4. The parting will be along the top edge of the flat bottom plate. The bottom and upright pieces are made of one inch timber for an ordinary 4½ in. lathe—a little smaller for a smaller lathe, and a little thicker for a bigger lathe, although it will seldom be required thicker, since it is for use in the small workshop, to take the place of a heavier drilling machine than the usual amateur's drill press.

In the pattern, the face B, Fig. 3, will be vertical to the bottom plate, but the back C, Fig. 4, can have a little draught, so as to allow it to clear the sand when drawing the pattern in moulding. The angle piece D, Fig. 4, should have a little draught also. It is simply bradded in position, but the joint should be good and close, so that it does not hold the sand.

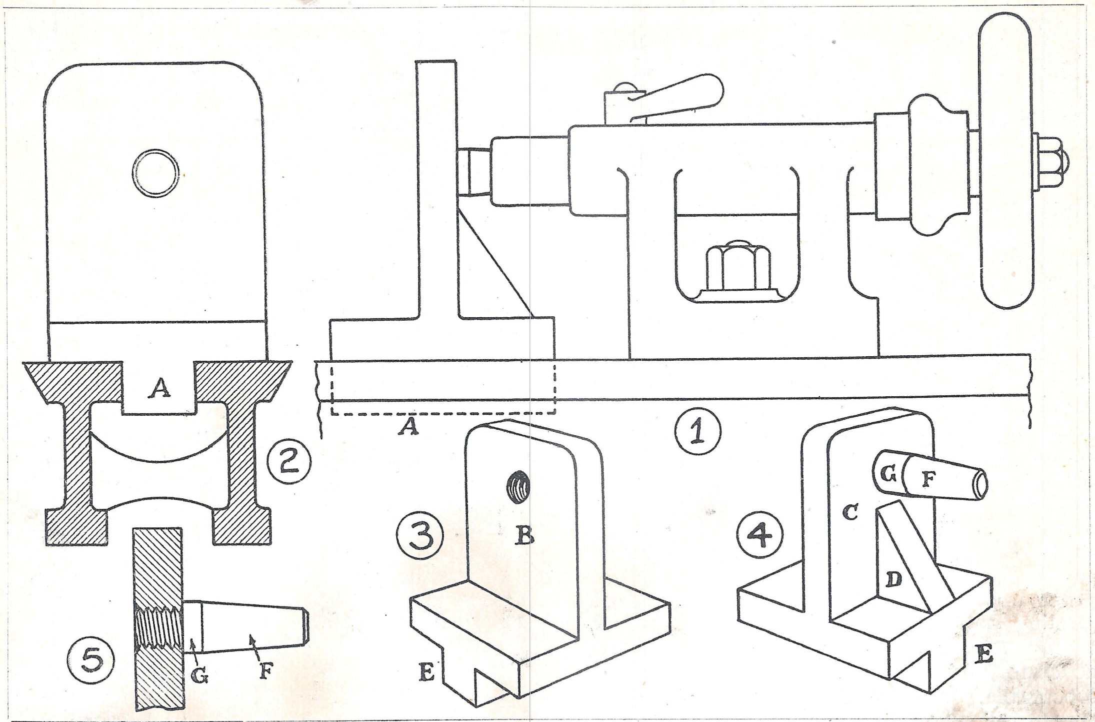
The bottom piece E should be screwed up to the bottom plate, and its width should be a sixteenth wider than the width between the lathe bed-ways to allow for cleaning up to fit.

The pattern, when finished, should be painted, rubbed down with glass paper, and then have a final thin coat of paint. When received from the foundry, the face B, Fig. 3, should be cleaned up with a coarse file to a smooth surface, and the tenon piece E and the under side should be similarly cleaned up. The tenon should fit nicely, without side shake, between the ways of the bed, as in Fig. 2.

The centre piece F, Figs. 4 and 5, should be turned out of mild steel bar to fit the back headstock barrel and should be screw-cut to Whitworth standard of a diameter a little less than the parallel part G, so as to leave a shoulder. The screw part should be a sixteenth of an inch longer than the thickness of the upright part of the jig so that it can be rivetted over when screwed up hard against the shoulder.

To get the hole for the centre at the correct position, a drill, the tapping size of the thread on the centre, is chucked in the three jaw chuck, and the casting resting in its working position, should be fed up to the drill by using the back headstock barrel and hand wheel. Then the screw thread should be cut with a tap, and the front of the hole slightly countersunk, to allow of the screwed end of the centre being riveted over, after it has been screwed hard up to the shoulder, and filed off flat.

In use, the centre will enter tightly into the



back poppet headstock barrel, and the jig can be drawn back, or fed up to the lathe mandrel for drilling, by the hand-wheel.

If made with care, very accurate drilling work and counter-boring, etc., can be done with this tool, which, as will be seen, can be very quickly applied, it only being necessary to slide the jig along the bed and centre it in the back headstock. There is no bolting, and the jig always feeds up quite square with the lathe mandrel if the vertical face is made square with lathe bed.

A Lock and a Hinge made from Nails.

By F. Y.

Nails are cheap enough, and the two hints below show how nails can take the place of fittings that may cost up to a shilling or more. Figs. 1 and 2 show a nail B used as a lock on work-shed doors, tool cupboards, and wherever there is a snek action fastener.

A hole is made in the door above the snek bar, and a nail pushed through. The nail must be a push fit, so that it can be moved with the fingers and yet not wobble. If done properly, it holds down the snek, and serves as a good lock. Should one wish to lock the door from within, a swivel wedge A will serve. Fig. 3 shows a nail being used as a hinge on light doors, such as tool cupboards, etc. The sketch is self explanatory.

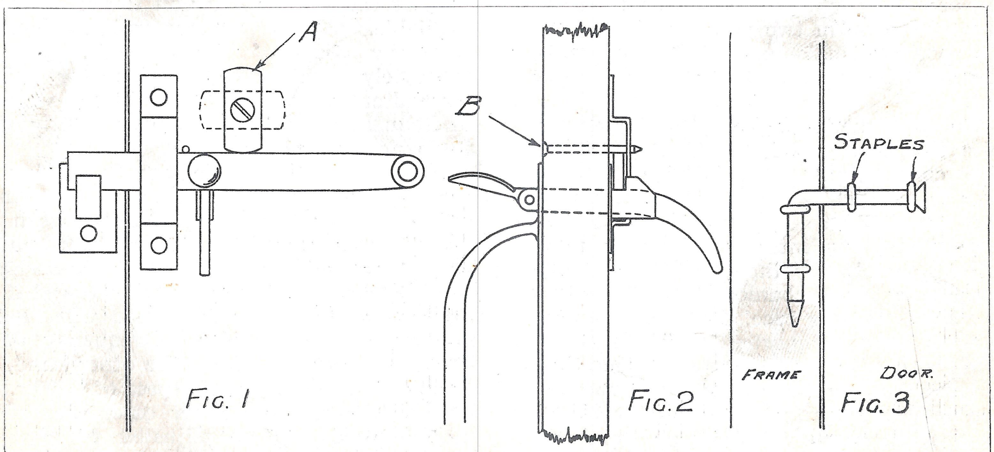


FIG. 1 FIG. 2 FIG. 3

QUERIES and REPLIES

Querists must comply with the Conditions and Rules given with the Query Coupon in the Advertisement Page of each issue.

6,837.—Soft Solder.—P.G.B. (Fulham).

Q.—Can you tell me where I can obtain a small quantity of solder with a little higher melting point than ordinary tinman's or blow pipe solder, suitable for sweating a riveted model boiler?

A.—So far as we are able to discover, the only firm likely to be able to supply this is Messrs. Locke Lancaster and W. W. & R. Johnson and Sons, Ltd., 3, New London Street, E.C.3. This firm, for the first part, are the biggest lead refiners, and will not supply you with small quantities, but they may advise you, if you write referring to THE MODEL ENGINEER, whether it is made, and if so, where it can be procured retail.

We would suggest that the normal highest running plumber's solder, containing 2 lead, 1 tin, would be all you require. You can find, no doubt, from the above firm where this is procurable. You could of course easily make it your self by getting chemically pure lead and melting it with tin in the proportions given by weight, or get your local plumber to do it for you.

6,850.—The Wireless Interference Problem.—K.K.B. (Hythe).

Q.—I am using an old type Ford coil (with trembler) for the ignition of a 1/8th h.p. petrol engine. This causes interference with wireless reception in the immediate neighbourhood, and I wonder if you could inform me how to avoid causing this interference.

If I did away with the trembler, would this be sufficient, and if so, how could I cut the trembler out?

A.—The problem of eliminating wireless interference caused by an ignition trembler coil is a very difficult one, and we think that cutting out the trembler would be advisable. This may be done in two ways, but in either case a positive make and break contact-breaker must be employed, instead of a wipe contact.

In the first method, the contact breaker occupies the same position in the circuit as the wipe contact, and a condenser of suitable capacity is shunted across it. The trembler contacts are screwed down hard, i.e., shorted.

Alternatively, the internal condenser may be utilised, by *opening* the trembler contacts and connecting the mechanical contact breaker across them. In this case, the wipe contact connections must be shorted. Care must be taken in this case to see that no shortcircuiting of the low tension system results from the use of a double earth return; it is better to connect the lead which would normally go from the coil to the wipe contact direct to the negative of the battery.

The actual spark interference could then be minimised by the use of a "suppressor" in the high tension lead.

6,764.—Treadle for Lathe.—W.W. (Wakefield.)

Q.—I am constructing a treadle to drive my lathe counter-shaft, out of a small gas engine flywheel and crank. The flywheel weighs approximately 1 cwt. and the crank has a 2″ throw. Could you let me know if the 2″ throw is too much or if the wheel will be heavy enough; the shaft is to run in white metal bearings, also, where is the best place to make connecting rod connection on the treadle?

A.—The proportion of the throw of a crankshaft is governed by the best treadle stroke for the average height of the user of the lathe. One may take this as being about 7″. In this case, if the treadle is made, say, 20″ long from hinge to foot edge, and the pitman mounted 12″ from the hinge, we get 12:20 : 4″ crank stroke : just under 7″ foot stroke, which should do well for the size lathe given. The pitman must be pivoted vertically below the crank pin, with the same horizontally placed at the front half stroke. Then the wheel of 56 lb., which is ample weight, should be so balanced that it comes to rest holding the weight of the treadle up with the crank pin in front, rather above the mid stroke position, say, at about 30° to horizontal, or less. This when the lathe mandrel is in balance or the driving belt unshipped. The bottom position of the treadle need not be more than 2″ above floor level. For a person of under middle height, 6″ foot stroke will be found ample, putting the pitman at 13″ from the hinge.

6,852.—D.C. to A.C. Converter.—J.S.W.R. (Southwick).

Q.—I am removing my alternating current mains wireless receiving set from this district where the supply is 230 volts 50 cycles, to a district where only 220 volt direct current is available. Would you recommend the use of a rotary converter, or an A.C. generator separately driven from a D.C. motor which I have already available? Would any variation of frequency in the A.C. supply greatly affect its performance?

A.—We should advise you to employ the motor-alternator set rather than the single-unit converter, for the reason that with two separate machines, both voltage and frequency are under entire control. The frequency is, of course, a function of the speed, and if the alternator has 2-pole fields, you will need to run at 3,000 r.p.m. for a frequency of 50 cycles per second; if, on the other hand, the field is of the 4-pole type, a speed of 1,500 r.p.m. will be correct. In either case, the driving motor speed can be adjusted to give the precise frequency required, by means of a field regulating resistance (if shunt wound). And quite independently of speed, the alternator voltage can be adjusted in similar manner, independent of its speed, by providing an

adjustable field regulator to control its field excitation. As you already have the driving motor, the additional outlay is not very great, as any D.C. motor capable of giving a sufficiently high voltage can be converted into an A.C. generator by adding two insulated sliprings to the commutator, each one connected to one of two commutator bars separated by the same distance as the pole pitch, that is, 180 deg. for a 2-pole field, or 90 deg. for a 4-pole field. Single phase alternating current can then be drawn from the sliprings, controlling the frequency by the speed, and the voltage by the field excitation. We should advise you to keep the frequency as constant as possible, as any change in this respect would alter the inductance values.

6,872.—Patenting Cups for Pelton Wheels. —J.W. (Llanelly).

Q.—Do you know whether there are any patents connected with the cups or buckets of the Pelton water wheel, as I think I have a new idea about the cups.

A.—We do not know if any patents are in force relating to Pelton wheel buckets, we doubt if there are any, but you could ascertain by employing a patent agent to investigate. Alternately, you could apply for a patent for your invention ; when you had filed your complete specification, the Patent Office will make a search for a period of 50 years back, and would notify you if there are any previous patents which anticipate your idea. Our book "Patents Simply Explained" would assist you to make application for a patent on your own account if you do not think fit to go to the expense of employing a patent agent. The shape of buckets used has been evolved by calculations and experience to give high efficiency. You will find some information and illustrations in the MODEL ENGINEER, of May 9th, 1929, the previous instalments of the article are in the issue of February 21st and May 2nd, same year. The efficiency of a Pelton wheel is stated to be over 86 per cent., so there is not much margin for improvement.

6,873.—Building a Turbine Driven Model Cruiser.—A.R.W. (Grimsby).

Q.—I am building a cruiser $5\frac{1}{2}$ ft. × 9 in. beam, and am considering making a turbine 3 in. diameter with about 4 rotors and 3 fixed blades, but have been unable to find a suitable diagram. In the handbook "Model Turbines," only the De Laval seem to be mentioned. Could you give me any advice about construction, and if a 25 ft. × $\frac{1}{4}$ in. × 20 G. flash boiler heated by twin blowlamps would generate enough steam to give the turbine power to drive the boat at a reasonable speed, or if a compound turbine is not practicable, would 2 or more De Laval turbines on the same shaft driven by the flash boiler do so? If so, what bore and stroke would the pump or pumps be, and at what reduction should they be driven?

A.—You must be prepared to experiment a good deal if you wish to produce a successful turbine plant for a model boat. The main difficulty in producing a compound stage turbine in a small size is the complexity of the rotor and stator blading, and in arriving at the required sizes of the components to give proper expansion and utilisation of the steam energy. A single impulse wheel of the De Laval type will, if correctly designed and made, and run at sufficiently high speed, produce quite a high efficiency. If you decide on a compound turbine, however, we suggest using three of four impulse wheels in separate casings, with the steam admitted to each in series, the sizes of nozzles being made progressively larger from the h.p. to the l.p. stage. There is no advantage whatever in using several turbines in parallel ; it would be better to use a larger rotor, or extra nozzles acting on one rotor.

The size of boiler, also the size and reduction gear for the feed pump, depend on so many factors that without knowing every detail of your plant, including its performance, our advice would be indefinite, and the only possible way to progress is by careful and painstaking experiment.

5,445. — Soldering Brass. — E.C.J.F. (Cross-in-Hand).

Q.—I am making a processional cross in brass for our local church and would like to know the following:—

(1) A solder which will melt at a low temperature so as not to discolour the brass by heat, and yet make a firm joint.

(2) A flux for use with the above.

(3) A soiling to paint the brass with round the joint to prevent the solder running where it is not wanted, and to be able to fetch the soiling off by some means other than scraping and leave the polished surface unmarked.

A.—If you procure our handbook, "Soldering, Brazing and Jointing of Metals" (price 10d., post free, from our Publishing Department), you will learn much by reading of soft and hard soldering, which, applied in the manner you require, is a fine art, requiring experience to get the very best results. It is doubtful whether you can make anything in brass, finished in parts, and then solder it together without any final cleaning of oxide or other discolouration. The point is the art of finishing the work after soldering, which is the usual way of doing it, and this, taken in conjunction with the method of soldering, preferably by the use of suitable bits and thus avoiding the use of a soiling preparation, which is seldom used in fine soldering. Soiling is generally only used in plumbers lead soldering and wiping, which is a much rougher type of jointing than you contemplate doing. If you solder brass properly, the solder will not run where it is not wanted, and in this the whole art of soldering lies. The finest flux you can use for soft soldering is chloride of zinc, and this must all be carefully washed off afterwards. The book mentioned tells you the composition of low running solders as well as ordinary bit solders.

PRACTICAL LETTERS from OUR READERS

Firebars for Model Locos.

DEAR SIR,—With reference to the recent correspondence on the above subject, a friend of mine made up a grate from worn-out three-cornered files. They have been in service on a $2\frac{1}{2}''$ gauge loco. for nearly a year, and have proved successful.

Yours faithfully,
Hull. J. M. PROUD.

Tapered Loco. Boilers.

DEAR SIR,—With reference to Mr. Chas. S. Lake's notes on the various points of advantage of the tapered as compared with the parallel form of locomotive boiler barrel, and his invitation to your readers to put forward any further views, I would ask to be allowed to mention another feature apropos to the first named design. During a visit some years since to Swindon Works, and in conversation with an important official of the locomotive department, I was informed that one of the advantages of contracting the diameter of the barrel at the leading end was that in running downhill the depth of water over the top of the firebox was maintained to a greater height than in the case of the parallel type, which allowed so much more to surge to the front end under similar circumstances.

Be this as it may, the merits of the tapered form of barrel as set out by Mr. Lake are logical—Mr. Stainer would not have employed that form in his new engine designs for the L.M.S., unless he had considered the advantages were obvious.

Yours faithfully.
London, N.W.6. A. M. H. SOLOMON.

Short Wave Radiations.

DEAR SIR,—In answer to your correspondent, Mr. F. Massey, I should like to point out the following ways in which heterodyning can be demonstrated in the case of light waves.

(*a*) If a lens of large radius of curvature be placed on a flat plate of glass, and if the point of contact be viewed in white light, coloured rings can be seen. These are due to interference patterns (Heterodyne "notes"). This was first demonstrated by Hooke, and was carefully studied by Newton. They are now known as "Newton's rings."

(*b*) The type of spectroscope which uses a diffraction grating relies on the reflection of rays of light having definite phase differences from one another.

(*c*) An oil film on water produces its typical coloured appearance because the rays of light reflected from opposite sides of the film are out of phase.

The mechanism of these phenomena is discussed fairly fully in most standard text books on physics.

Until this evening, I vaguely imagined that another common occurrence came under this heading, viz., if a red and a green "lime" light in a theatre be focussed on the same spot, the result is a yellow patch. However, I have run over the mathematics of the case, and as far as I can see (E. & O.E.) interference is not a tenable theory. A text book reminds me that Young and Helmbrody have attempted to explain this case by a three-colour theory of colour vision, but that it is still a subject of debate.

Regarding the cosmic ray question, I know nothing, but seem to remember reading that someone suggested that electrons, and hence all matter, might be whirlpools in the ether.

Yours faithfully,
London, S.E. ROBERT J. PARRIS.

Model Locomotive Performance.

DEAR SIR,—I should like to have the opportunity of congratulating Mr. Henry Greenly upon the wonderful performance put up by the gauge 1, 2-6-4 tank locomotive which he designed for Mr. Victor B. Harrison, described in the "M.E." for Dec. 19th. That such a small model loco. could cover a distance of nearly $1\frac{3}{4}$ miles non-stop is extraordinary, and is a great tribute to Mr. Greenly's abilities as a designer.

I must also congratulate Mr. A. P. Campbell, the builder of this model, as without his excellent workmanship such a result would not have been possible. Mr. Campbell I know to be a real craftsman, and his tool-room methods of construction must have been a big factor in the results obtained. No doubt when the cylinder lubrication has received attention, the loco. will considerably exceed even its present phenomenal performance.

To borrow Mr. Chas. S. Lake's very apt term, it is evidently a model loco. with a "very high cylinder performance."

Mr. Greenly is absolutely correct when he wrote in the "M.E.," of Dec. 12th, about the inaccurate data that is afloat regarding model locomotives.

Full size locomotive engineers are now realising, more than ever before, the value of designing locomotives to give the *highest possible cylinder performance*, and that means enlarged boiler capacity in relation to cylinder volume, high boiler pressure coupled with extra large regulator ports, steam and exhaust pipes, also cylinders with properly designed ports and passages, and long travel large lap valves, etc., etc.

Much the same thing is being done in automobile work; the cylinder performance of the modern internal combustion engine is now far higher than it was ten years ago.

Let us, therefore, for 1936, cease to be out of date, and design our model locomotives for high cylinder performance and efficiency.

Yours faithfully,
Brixton. G. S. WILLOUGHBY.

adjustable field regulator to control its field excitation. As you already have the driving motor, the additional outlay is not very great, as any D.C. motor capable of giving a sufficiently high voltage can be converted into an A.C. generator by adding two insulated sliprings to the commutator, each one connected to one of two commutator bars separated by the same distance as the pole pitch, that is, 180 deg. for a 2-pole field, or 90 deg. for a 4-pole field. Single phase alternating current can then be drawn from the sliprings, controlling the frequency by the speed, and the voltage by the field excitation. We should advise you to keep the frequency as constant as possible, as any change in this respect would alter the inductance values.

6,872.—Patenting Cups forPeltonWheels.—J.W. (Llanelly).

Q.—Do you know whether there are any patents connected with the cups or buckets of the Pelton water wheel, as I think I have a new idea about the cups.

A.—We do not know if any patents are in force relating to Pelton wheel buckets, we doubt if there are any, but you could ascertain by employing a patent agent to investigate. Alternately, you could apply for a patent for your invention ; when you had filed your complete specification, the Patent Office will make a search for a period of 50 years back, and would notify you if there are any previous patents which anticipate your idea. Our book " Patents Simply Explained " would assist you to make application for a patent on your own account if you do not think fit to go to the expense of employing a patent agent. The shape of buckets used has been evolved by calculations and experience to give high efficiency. You will find some information and illustrations in the MODEL ENGINEER, of May 9th, 1929, the previous instalments of the article are in the issue of February 21st and May 2nd, same year. The efficiency of a Pelton wheel is stated to be over 86 per cent., so there is not much margin for improvement.

6,873.—Building a Turbine Driven Model Cruiser.—A.R.W. (Grimsby).

Q.—I am building a cruiser 5½ ft. × 9 in. beam, and am considering making a turbine 3 in. diameter with about 4 rotors and 3 fixed blades, but have been unable to find a suitable diagram. In the handbook " Model Turbines," only the De Laval seem to be mentioned. Could you give me any advice about construction, and if a 25 ft. × ¼ in. × 20 G. flash boiler heated by twin blowlamps would generate enough steam to give the turbine power to drive the boat at a reasonable speed, or if a compound turbine is not practicable, would 2 or more De Laval turbines on the same shaft driven by the flash boiler do so? If so, what bore and stroke would the pump or pumps be, and at what reduction should they be driven?

A.—You must be prepared to experiment a good deal if you wish to produce a successful turbine plant for a model boat. The main difficulty in producing a compound stage turbine in a small size is the complexity of the rotor and stator blading, and in arriving at the required sizes of the components to give proper expansion and utilisation of the steam energy. A single impulse wheel of the De Laval type will, if correctly designed and made, and run at sufficiently high speed, produce quite a high efficiency. If you decide on a compound turbine, however, we suggest using three of four impulse wheels in separate casings, with the steam admitted to each in series, the sizes of nozzles being made progressively larger from the h.p. to the l.p. stage. There is no advantage whatever in using several turbines in parallel ; it would be better to use a larger rotor, or extra nozzles acting on one rotor.

The size of boiler, also the size and reduction gear for the feed pump, depend on so many factors that without knowing every detail of your plant, including its performance, our advice would be indefinite, and the only possible way to progress is by careful and painstaking experiment.

5,445. — Soldering Brass. — E.C.J.F. (Cross-in-Hand).

Q.—I am making a processional cross in brass for our local church and would like to know the following:—

(1) A solder which will melt at a low temperature so as not to discolour the brass by heat, and yet make a firm joint.

(2) A flux for use with the above.

(3) A soiling to paint the brass with round the joint to prevent the solder running where it is not wanted, and to be able to fetch the soiling off by some means other than scraping and leave the polished surface unmarked.

A.—If you procure our handbook, " Soldering, Brazing and Jointing of Metals " (price 10d., post free, from our Publishing Department), you will learn much by reading of soft and hard soldering, which, applied in the manner you require, is a fine art, requiring experience to get the very best results. It is doubtful whether you can make anything in brass, finished in parts, and then solder it together without any final cleaning of oxide or other discolouration. The point is the art of finishing the work after soldering, which is the usual way of doing it, and this, taken in conjunction with the method of soldering, preferably by the use of suitable bits and thus avoiding the use of a soiling preparation, which is seldom used in fine soldering. Soiling is generally only used in plumbers lead soldering and wiping, which is a much rougher type of jointing than you contemplate doing. If you solder brass properly, the solder will not run where it is not wanted, and in this the whole art of soldering lies. The finest flux you can use for soft soldering is chloride of zinc, and this must all be carefully washed off afterwards. The book mentioned tells you the composition of low running solders as well as ordinary bit solders.

PRACTICAL LETTERS from OUR READERS

Firebars for Model Locos.

DEAR SIR,—With reference to the recent correspondence on the above subject, a friend of mine made up a grate from worn-out three-cornered files. They have been in service on a $2\frac{1}{2}''$ gauge loco. for nearly a year, and have proved successful.

Yours faithfully,

Hull. J. M. PROUD.

Tapered Loco. Boilers.

DEAR SIR,—With reference to Mr. Chas. S. Lake's notes on the various points of advantage of the tapered as compared with the parallel form of locomotive boiler barrel, and his invitation to your readers to put forward any further views, I would ask to be allowed to mention another feature apropos to the first named design. During a visit some years since to Swindon Works, and in conversation with an important official of the locomotive department, I was informed that one of the advantages of contracting the diameter of the barrel at the leading end was that in running downhill the depth of water over the top of the firebox was maintained to a greater height than in the case of the parallel type, which allowed so much more to surge to the front end under similar circumstances.

Be this as it may, the merits of the tapered form of barrel as set out by Mr. Lake are logical—Mr. Stainer would not have employed that form in his new engine designs for the L.M.S., unless he had considered the advantages were obvious.

Yours faithfully.

London, N.W.6. A. M. H. SOLOMON.

Short Wave Radiations.

DEAR SIR,—In answer to your correspondent, Mr. F. Massey, I should like to point out the following ways in which heterodyning can be demonstrated in the case of light waves.

(*a*) If a lens of large radius of curvature be placed on a flat plate of glass, and if the point of contact be viewed in white light, coloured rings can be seen. These are due to interference patterns (Heterodyne "notes"). This was first demonstrated by Hooke, and was carefully studied by Newton. They are now known as "Newton's rings."

(*b*) The type of spectroscope which uses a diffraction grating relies on the reflection of rays of light having definite phase differences from one another.

(*c*) An oil film on water produces its typical coloured appearance because the rays of light reflected from opposite sides of the film are out of phase.

The mechanism of these phenomena is discussed fairly fully in most standard text books on physics.

Until this evening, I vaguely imagined that another common occurrence came under this heading, viz., if a red and a green "lime" light in a theatre be focussed on the same spot, the result is a yellow patch. However, I have run over the mathematics of the case, and as far as I can see (E. & O.E.) interference is not a tenable theory. A text book reminds me that Young and Helmbrody have attempted to explain this case by a three-colour theory of colour vision, but that it is still a subject of debate.

Regarding the cosmic ray question, I know nothing, but seem to remember reading that someone suggested that electrons, and hence all matter, might be whirlpools in the ether.

Yours faithfully,

London, S.E. ROBERT J. PARRIS.

Model Locomotive Performance.

DEAR SIR,—I should like to have the opportunity of congratulating Mr. Henry Greenly upon the wonderful performance put up by the gauge 1, 2-6-4 tank locomotive which he designed for Mr. Victor B. Harrison, described in the "M.E." for Dec. 19th. That such a small model loco. could cover a distance of nearly $1\frac{3}{4}$ miles non-stop is extraordinary, and is a great tribute to Mr. Greenly's abilities as a designer.

I must also congratulate Mr. A. P. Campbell, the builder of this model, as without his excellent workmanship such a result would not have been possible. Mr. Campbell I know to be a real craftsman, and his tool-room methods of construction must have been a big factor in the results obtained. No doubt when the cylinder lubrication has received attention, the loco. will considerably exceed even its present phenomenal performance.

To borrow Mr. Chas. S. Lake's very apt term, it is evidently a model loco. with a "very high cylinder performance."

Mr. Greenly is absolutely correct when he wrote in the "M.E.," of Dec. 12th, about the inaccurate data that is afloat regarding model locomotives.

Full size locomotive engineers are now realising, more than ever before, the value of designing locomotives to give the *highest possible cylinder performance*, and that means enlarged boiler capacity in relation to cylinder volume, high boiler pressure coupled with extra large regulator ports, steam and exhaust pipes, also cylinders with properly designed ports and passages, and long travel large lap valves, etc., etc.

Much the same thing is being done in automobile work; the cylinder performance of the modern internal combustion engine is now far higher than it was ten years ago.

Let us, therefore, for 1936, cease to be out of date, and design our model locomotives for high cylinder performance and efficiency.

Yours faithfully,

Brixton. G. S. WILLOUGHBY.

Cornish Engines.

DEAR SIR, — Your correspondent, who enquires, in the January 2nd MODEL ENGINEER, for information re Cornish side lever pumping engines, will find two illustrations, or rather small scale drawings, of these engines in "Modern Steam Practice," by John G. Winter (2 vols. published by Blackie and Son, in 1883). There is, however, no mention of size or situation.

This work is very descriptive and includes engravings and descriptions of 90 in. Cornish engine, and waterworks engines, blowing engines of beam, side lever, table types, etc., the blowing engines of beam type erected at Dowlais Iron Works, with 55 in. bore × 13 ft. stroke steam cylinder, 20 double strokes per min., 60 lb. pressure. Blowing cylinder 144 in. diameter × 12 ft. stroke. Beam is 40 ft. long and weighs 33 tons, flywheel is 22 ft. diameter, weighing 35 tons.

The rolling mill engines erected at Dowlais Iron Works are also described. The following are chief particulars: "Two steam cylinders 45 in. diameter × 10 ft. stroke coupled at right angles to one another, 24 revs per min. Engine supported on four lines of cast iron framing, each 75 ft. long, 12 ft. high and 21 inches wide, each beam weighs 37 tons, and the two beams each supported on eight columns 24 ft. long × $2\frac{1}{2}$ ft. diameter, upon which rests a heavy entablature plate. Each column passes through entablature, the bosses at junction being 24 inches lap; these are bored out and tops of columns turned to ensure a perfect fit. The driving wheel shaft, i.e., crank shaft, is cast iron 24 inches diameter, flywheel shaft 21 inches diameter. Diameter of driving wheel 25 ft. at pitch line by 27 inches wide, 7 in. pitch teeth, pinion on flywheel shaft 6 ft. diameter, flywheel 21 ft. diameter, 30 tons weight, making upwards of 100 revs. per minute. The whole of fastenings, both of wheels and framings, are of dry oak and iron wedges. The connecting rods are of oak with wrought-iron straps as are also those of the blowing engines." I expect the above engines have long since been broken up.

Yours faithfully,

Selly Oak. GEO. B. ROUND.

False Planes for Speed Boats.

DEAR SIR,—As the subject of false planes for speed boats has attracted some attention lately, perhaps these notes may be of interest to your readers.

The following figures are the result of "towing tests" on the circular course, and are intended to show that a very small area of planing surface is sufficient for speeds over 25 m.p.h. with a metre hull.

Particulars of hull tested: weight $8\frac{1}{2}$ ozs., length 15″, beam 4″.

A single false plane having a surface 4″ × $\frac{1}{2}$″, flat each way, carries all the weight. Inclination of plane 1 in 12, governed by a small submerged plane measuring $\frac{3}{4}$″ × $\frac{1}{2}$″, attached to a bracket at the stern.

The centre of gravity in this model was $\frac{1}{8}$″ aft of the front edge of the false plane and would be better further aft. The tow line is attached at the c.g.

This hull rises on to the false plane at 15 m.p.h., and the highest speed so far attained is 39 m.p.h. Equivalent speeds for a 40″ hull would be 25 m.p.h. and 63 m.p.h.

Under these conditions of towing, this hull shows no tendency whatever to dangerous behaviour.

On one run, the rear submerged plane became detached, and was lost, due to striking a floating obstruction.

The hull continued on its course in much the usual manner, since the stern of the hull had dropped on to the water and was acting as a surface plane. This would increase slightly the inclination of the false plane. However, when the pull of the tow line fell to zero on completion of the run, the false plane dug in, and the hull crashed in the approved manner.

The explanation is that the stern lifted, due to the c.g. being above the area of support and also of resistance. This converted the angle of inclination to a negative one with the result that the false plane drew the hull under.

A submerged rear plane prevents this happening. The false plane needs to be of quite stiff construction to prevent distortion. In my case, it is part of a stainless steel knife blade, and highly polished. I am inclined to think that a submerged rear plane may be a necessity with a false plane of this type, due to the likelihood of digging in when the motor is switched off.

For speeds much over 40 m.p.h., the false plane of small area would appear to have an undoubted advantage over the scow type of hull, in that it does not jump appreciably when encountering the waves of its own making, which it is bound to do on a circular course.

In my trials, a limiting factor at speeds much above 40 m.p.h., for a metre hull of scow type, has been the lifting action of the air beneath the hull. This is quite sufficient to make the hull fly.

Yours faithfully,

Herstmonceux. J. C. HUDSON.

Model Engineering in France.

DEAR SIR,—In the very interesting account of the model display in the Paris terminus of the P.L.M. Railway, I observe that the writer remarks that model makers "were few in number" among the visitors. There would be good reason for this, inasmuch as model making in Paris, or for the matter of that, in the provinces, has not the following at all comparable with the call here. It is not that the French are not mechanically minded; on the contrary, they are, as is demonstrated by their inventive faculties, and the wonderful exhibition of apparatus and small mechanical work at the Arts and Metiers Museum. The real reason for lack of model engine making among amateurs is, I think, chiefly due to people living in flats in Paris and in large towns, where it is naturally undesirable to run a workshop with its attendant noises. A further cause is perhaps the lack of businesses catering for model makers, such as we have

here, and there is no MODEL ENGINEER apparently to encourage the cause and to assist the worker.

There used to be an interesting model shop in the Rue Boissy d'Anglas, where I recollect seeing fine boats, both steam and I.C. engined, also sailing vessels, but the establishment has long since disappeared. For many years there was Perinot's shop on the Boulevard St. Michel; he sold castings and other sundries, and used to make excellent locomotives, boilers and marine engines. I have had many interesting chats with him, but learnt at my last visit a few years ago that he intended to close down on model making and move to the suburbs and concentrate on the manufacture of small power steam turbines for commercial purposes. When I next passed, Perinot had gone. That the French are enthusiastic about running miniature railways is evidenced by your contributor's graphic description of the Sunday crowds at the exhibition. By a coincidence, at the moment of writing I have received corroboration of this in a letter from a French friend, who states—" The December shop exhibits are now in full swing, and all the favour goes to model railways, where streamlined engines and rail-cars are prominent. The Association des Amis des Chemins de Fer has lent their collection to the Galeries Layfayette, and the show is patronised by lots of people."

The outdoor passenger carrying miniature railway is not altogether new in France—a little locomotive of about 15 inches gauge, pulling 5 or 6 truck loads of passengers round a track of about 60 feet diameter, used to be a feature at the annual fete of St. Cloud (the Richmond of Paris) in the years before the war. The driver, a bearded old man, I recall distinctly, wore the same ancient straw hat every season, and each time I saw him, it was more mellowed and irregular in contour! He and the equipment visited fairs in various nearby towns.

Yours faithfully,
London, N.W.6. A. M. H. SOLOMON.

Institutions and Societies.

The Society of Model and Experimental Engineers.

Meetings. At Caxton Hall, Westminster, at 7 p.m.

Thursday. January 23rd. Competition, Track and Model Night.

Friday, February 14th. Ladies' Night. Lecture by G. R. Stevenson, Esq., F.R.G.S., on " Work and Play on a Sarawak Oilfield."

President's Prize. Our President for this year, Mr. T. N. Gilbert, has not only put up prizes for a competition such as has been held during the past year, but has also offered a prize to be awarded on each C.T. & M. Night for the best display of work on that evening. The *only* restriction is that work gaining an award is not eligible for subsequent competitions in this series. The *only* restriction for the major competition is that work having already been awarded a President's Prize is not eligible, but even such work may be entered again, though only the portion added since the award will be taken into consideration.

Secretary, R. W. WRIGHT, 202, Lavender Hill, Enfield, Middlesex.

The Kent Model Engineering Society.

The Kent Model Engineering Society will hold their next meeting on Jan. 31st, at 8 p.m., at Sportsbank Hall, Catford, S.E.6. This will take the form of a practical demonstration by Mr. W. J. Hillier on " Hardening and Tempering Small Tools"; those members who are in trouble with any tool problems of this nature are invited to bring them along for the lecturer to unravel.

On Feb. 11th, at 8 p.m., Mr. H. L. Smith will talk on " Model Locomotive Constructional Hints": the lecturer will show several gadgets he has constructed for use in his lathe which have got over the difficulty encountered.

Hon. Secretary, W. R. COOK, 38, Shorndean Street, Catford, S.E.6.

Romford Model Engineering Club.

The annual general meeting of the above club will be held on Thursday, the 16th inst., at 7.30 p.m., and members are requested to make every effort to attend—early. On the 23rd inst., we welcome Mr. J. N. Maskelyne, who is giving a lecture on " Locomotives that have failed in their expectations!"

Secretary, Mr. MILES SMITH, 86, Hornchurch Rd., Romford.

Notices.

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. Unless remuneration is specially asked for, it will be assumed that the contribution is offered in the general interest. All MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co., Ltd., 13-16, Fisher Street, London, W.C.1. Annual Subscription, £1 1s. 8d., post free, to all parts of the world. Half-yearly bound volumes, 11s. 9d., post free.

All correspondence relating to Advertisements and deposits to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 13-16, Fisher Street, W.C.1.

Contents.

The asterisk (*) denotes that the subject is illustrated.

Advertisements are inserted in these columns at the rate of **One Penny** *per word; minimum charge for advertisement,* **One Shilling.** *Single letters or figures are charged as words, and a compound word as two words. The advertiser's name and address are charged for.*

Advertisers who wish to separate *their announcements into distinct paragraphs must have not less than 20 words in any one paragraph followed by the word "Below"—which is charged for.*

"Box" replies, *care of these offices, are charged 6d. extra to cover postages. The following words must appear at end of advertisement: "Box——, 'Model Engineer' Offices," for which usual rate will be charged. (Advertisers need not include our full address.)* **When replying to a "Box No." advt.** *address your envelope: Advertiser, Box——, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

All advertisements in these columns must be prepaid, *and remittances should be made by Postal Orders or Stamps, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

Please state under which Classified Heading you wish your advertisement to appear; the classifications are as follows:—

General, Models, Wireless, Motoring
Tools, Engines, Electrical, Business, Wanted.

Advertisers are requested to send in their announcements as early in the week as possible, as although we accept advertisements up till the first post on Friday preceding the date of issue, **we cannot guarantee the insertion of those arriving on this day.** *Telephone: Holb.:* 3818-3819.

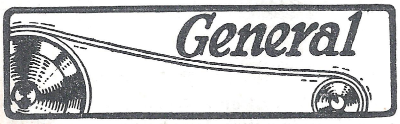
OUR DEPOSIT SYSTEM.

We will receive from intending purchasers the purchase money of any article advertised or sold by our advertisers, and will acknowledge its receipt to both the Depositor and the Vendor, whose full names and addresses must be given. Unless otherwise arranged beforehand between the parties, it is understood that all goods are sent on approval, and that each person pays carriage one way if the goods are returned. The deposit is retained by us until we are advised of the completion of the purchase, or of the articles having been returned and accepted. In addition to the amount of the deposit, a fee of 1/- for the sum of £1 and under, and 1/6 for amounts in excess of £1, to cover postage, etc., must be remitted at the same time, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the deposit must be sent either by Postal Order or Registered Letter. **(Cheques cannot be accepted.)**

The fee mentioned above should be sent in stamps or by Postal Order as a separate amount.

In cases of exchange, money to the value of the article should be deposited by each party. **We cannot receive the articles themselves.**



Watch Repairers. Send 3d. for list of Tools, Materials, Watches, Clocks, Gramophone Parts. Guaranteed watch repairs. Complete clock movements stocked. Parcels fully insured.—BLAKISTON, Ainsdale, Lancs.

Cheap Printing. 1,000 Billheads, 3s. 6d. Samples free.—CRETEWAY PRESS (22), Buxted, Sussex.

Small Turned Screws, Nuts and Washers. Assorted gross B.A., brass 2s., steel 2s. 6d. Whitworth, brass, 3s., steel, 2s. 6d. List and samples, 2d. Trade supplied.—J. H. BENNETT, Station Road, Willesden Junction, N.W.10.

Reduced Prices: Eureka Improved Air Compressors. Castings and Drawings from 9s. per set. Photo 3d.—POYSER, Peck's Hill, Mansfield.

Screws, Nuts, Washers (Special Model Engineers' Sizes). Everything for Electrical Rewinds and Repair. Lists free.—LUMEN ELECTRIC COMPANY, Scarisbrick Avenue, Litherland, Liverpool, 21.

Air Compressors, New patent, 25s.; Super Spray Guns, 17s. 6d. Complete plants.—JOHN M. E. STEEL, Bingley.

"Ajax" Safes Might Save Ruin from fire or theft any time. List, application.—GREENWOOD, Arnside Road, Southport.

Ball Bearing Plummer Blocks, 1", 5s.; ¾", 4s. 3d.; Gun Metal less 50 per cent., Shafting, Hangers, Pulleys, Cones, complete Countershafts from 10s.—Below.

Ball Journals, ¼", 9d.; ⅜" 1s.; ½" 1s. 2d.; ⅝", 1s. 4d.—HALL, 30, Collindale Avenue, Erith.

We have a tremendous stock of miscellaneous electrical and mechanical goods at absurd prices. Please send us a postcard stating your requirements.—JOHNSON ENGINEERING, 86, Great Portland Street, London, W.1.

Engine Black (heatproof); Brilliant Copal Varnish; sample tins 9d., post free.—WM. QUICK, Gurnard, Cowes.

For Sale, Pathescope Home Movie, with super attachment motor driven, anti-thermal lenses. In good condition, cost £16 16s. Bargain £8. Apply—SAWYER, "Query," Whitehall Road, Evington, Leicester, England.

"Model Engineer," 1918, 1919, 1920, 1921, 1922. Unbound. ¼ h.p. Gas Engine. Offers.—HAIGH, 26, Ray Gate, Mount, Huddersfield.

"M.E." Hexagon Head Screws, Nuts. Try Sample Shilling's Worth.—30, Highfield Road, Doncaster.

Typewriter Yost, 25s.; ⅛ h.p. Alternating Motor, 30s.; Banjo, 30s.—NEWTON, 265, Grays Inn Road, London.

Bourdon Pressure Gauge, Full Size (5"), 0/200, 12s. 6d.; another Bourdon Type (2½"), 0/200, 7s. 6d.; Air Compresser, 1½" by 1½", 100 lbs., 12s. 6d.; Smith Dynamo, 12 v., 8 a., 12s. 6d.; Lucas Type E. 3-6 v., 7s. 6d.; Three Small Motors 230 v., A.C./D.C., Ex. Hair Driers, Make Tool Post Grinders, 5s. each; Synchronome, ½-min. time transmitter, 15s. All sound Goods. Carriage paid.—CHORLEY & SON, 410, Borough Road, Birkenhead.

For 3" Lathe Users. Sensitive Drilling Machine, Castings, set of Parts and Blue Print, 12s., carr. forward. Blue print only, post free 1s., refund if castings, etc., ordered.—HIRST & Co., 119, Peas Hill Road, Nottingham.

The Flying Flea: How to Build and Fly it. Henry Mignet. Translated by the Air League of the British Empire. With Plans and Diagrams 7s. 6d. net.—PERCIVAL MARSHALL & Co., LTD., 13/16, Fisher St., W.C.1.

For Sale, Reliance Charging Plant, HT/LT, good order, electrically driven. Particulars on application.—Box 944, MODEL ENGINEER Offices.

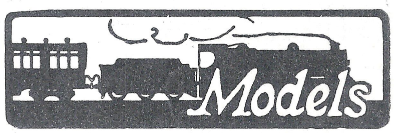
"The Home Handyman." 1,001 jobs in the home simplified. Contains nearly 2,000 illustrations. This book shows how to make innumerable things which go towards the completion of the home. The instruction given comes from thoroughly experienced practical men and women, and when the task has been accomplished there need be nothing about it to stamp it as the product of the amateur. Price 6s., by post 6s. 9d.—PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street, W.C.1.

Home Cinematography

Electric Home Cinemas, standard films, cheap. Lists.—WAYLAND, 109, Kenlor, Tooting, London.

Standard Films, splendid condition. "Topical Budgets," 500 ft., 2s. 6d.; Dramas, 1,200 ft., 8s. 6d.; Projection Lenses, 5s.—A. MUNDAY, Pinden, Dartford.

Movies at Home. How to make your own Cinema Projector. Particulars free.—MOVIESCOPE (O), Pear Tree Green, Doddinghurst, Essex.



"Pioneer" Castings and Parts, machined or rough. Stamped envelope for list.—FENN, 2a, Charles Place, Drummond Street, London, N.W.1.

Boilers in Steel or Copper, all types and sizes. Locomotives Boilers from ½" scale made to fit your frames, flanged plates, supplied copper or steel.—GOODHAND, Marlborough Road, Gillingham, Kent.

Bargains! Large stock to clear; some of the goods described are sold 70% below their actual factory cost; mostly foreign goods. Sailing, Clockwork, Electric and Steam Boats from 2s. 6d. to 15s. Also Steam Engines, Boilers, Locos., Trucks, Electric Motors by Stuart's, Marklin's, Bing's also Rails, Sheds, etc. Inspection invited without obligation.—F. C. REISER, 72, Twyford Avenue, W.3. Phone ACOrn 1783.

Finished Parts and Materials for high pressure steam locomotives, from "O" to 5" gauge. Get your parts from the makers of the famous "Ejaycee" High Pressure Steam Locomotive "Ejaycee" Models.—E. J. COOKE, 66a, George Street, Hastings.

½" **Scale Bassett-Lowke** 4-6-0, internally fired Loco. and Tender, together with Wagons and Track, £20.—Below.

¾" **Scale Coal-fired** Passenger Hauling Loco. and Tender, £25; also exceptionally fine 1" scale with trucks and quantity of track.—H. K., Willoughby House, Mablethorpe, Lincs.

Wanted, 1½" Scale Locomotive Outside Cylinder.—Reply to HORDERN, Quarry House, Kenilworth.

Dyak, Gauge 1, Driving Wheels, 2s. 6d. set; Pony and Tender, 2d. each; Water Gauge, 1s. 9d.; Pressure Gauge, 6s. 9d.—Below.

Powerful Traction Engine, 1¼" scale, Drawings, Castings, Materials. List 1½d. Horizontal Engine, Drawings, Castings, List, stamp.—A. J. EVERY, Mill Lane, Shoreham-by-Sea.

"Express Loco." Supplies Co., Maisie pump stay casting, 1s.: Passenger Trolley Mansell type Wheels, 1⅝" dia., 4d. each. Cupro-tectic brazing material.—52, Blanmerle Road, New Eltham.

"Models"—*continued.*

Dyak Frames, 2s.; Hornblocks and Axle-boxes, 3s. 9d. set; Driving Wheels, 8d.; Gunmetal Cylinders sets complete, 11s. See last issue for Boiler prices. Maisie. All Frames, 6s.; Hornblocks and Axleboxes, 6s.; Driving Wheels, 1s. 6d.; Gunmetal Cylinder Castings, 16s. Everything in stock. Postages extra.—SUMMERSCALES, Soham, Ely, Cambs.

Castings and Drawings for L.M.S. "Pacific," "The Princess Royal," and Southern Railway "Schools" class, 4-4-0, 3 cyl. Both 3½" gauge. These make up into close copies of originals. Also castings for 2½" and Gauge 1. Stamp.—H. P. JACKSON, 90, Holgate Road, York.

Fine Vertical Engine and Boiler. Excellent condition. Drives many models, 45s. Exchange ½" Scale Bassett-Lowke Six Coupled Tank Locomotive for Coal-fired Traction Engine, equal condition.—59, Summers Lane, Finchley.

30 c.c. 4-Stroke Engine, O.H.V. Water Cooled. Used in Speed Boat, 50s.; 2" Bore, 2" Stroke Vertical Steam Engine, Slide Valve, very fine Exhibition model. Engineer built, 40s. Stamp, reply.—Oakdene, Blue Bell Hill, Rochester.

"Bee" Miniature 2-Stroke Petrol Engines for racing boats, etc., simply made withou casting. Complete drawings, 1s. 9d.—COOK, 126, Woolstone Rd., S.E.23.

Grayspec Engine, Two Carburettors, Coil Plug. Hardly used, £2.—PAULIN, Town Hall, Hove.

"Stuart" No. 50 Mill Engine with Displacement Lubricator, Steamed. Once cost 55s. Bargain, 27s. 6d.; Bassett-Lowke Steam Donkey Pump, delivers against 60 lbs., worked 5 hours. Cost, 70s. Bargain, 35s.; "Stuart" built 60 watt Petrol "Lightweight" Generating Plant, Tanks, Ignition, run 5 hours. Cost, £16 10s. Bargain, £8. "Stuart" 504 Babcock Boiler, Pressure Gauge, Hand Pump, Pipes and Valve, Spirit Burner, Pipe for No. 10 or Mill Engine, beautiful Steamer. Cost, 120s. Bargain, 60s. lot.—EVANS, 21, Craven Road, Rugby.

Vertical Engine, ¾ by ¾ Trunk Guide, the very latest model, with the "Dyak" pattern boiler feed pump, engineer built, brand new, £3; also Driving and Coupling and Bogie Wheels 8 in all, finished and painted for Dyak 2½ G., 15s.—F. G. DODSON, 291, Molesey Road, Hersham.

Inch Scale North-Eastern Atlantic Copper Boiler, Steam Brakes, Powerful. Perfect condition. Cheap.—45, Elms Lane, Sudbury, Wembley.

Birmingham Model Railway Supplies. Agents for Leeds Model Co., Full range "OO" Rolling Stock. Demonstrations.—18a, Dale End.

1" Scale "Model Engineer" Traction Engine. "M.E." Locomotives, Castings. List, Stamp.—30, Highfield Road, Doncaster.

Bond's Super Detail C.W. Coaches, 25s. each. Can be seen Tuesdays, Thursdays, after 7 p.m.—G. RATHER, St. Mary's Vicarage, Provost St., City Road, N.1.

Fine Twin Cylinder Marine Engine, ½ by ¾, 14s.; Water tube Boiler, 2½ by 7½ complete, 10s. 6d.; powerful Boat Blow-lamps, 8s. 6d.; complete plant, ⅝ by ¾ marine engine, 2½ by 6 copper boiler, lamp, 17s. 6d.; model spank coil, 6s. 6d. All perfect. Particulars—GREYHOLME, 39, Moat Avenue, Coventry.

30 c.c. Highly Efficient Marine 4 str. Petrol Engine. Main and camshaft on ball bearings. Lubrication direct pressure feed to big end. Hemispherical head with inclined valves, £6. Exchange for 15 to 30 c.c. 2 str. Aero Engine.—P. B. WEBB, Randalstown, N.I.

Atlantic 1" Scale Loco., Bakers Valve Gear, Passenger Haulier, 5" gauge, Hand Brakes, etc. Excellent condition, £65.—Box 942, MODEL ENGINEER Offices.

"Model Steam Locomotives." Their Details and Construction. By Henry Greenly, A.I.L.E. With 376 photographs, diagrams and working drawings. Choice of Scale and Gauge—Locomotive Types—The Principles of Model Locomotive Designs—Boiler Design—Construction Details: Frames—Axle-boxes and Springs—Wheels, Axles, Crank Axles and Crank-pins—Bogies, Pony Trucks and Radial Axle-boxes—Cylinders—Valve Gearing: Motion Details—Boiler Construction—Boiler Mountings and Cab and other Fittings—Tenders and Drawgear—Firing and Boiler-feeding Devices. Price 6s. 6d., post free.—PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street, London, W.C.1

LIGHT MACHINERY
Sales and Wants

Tools

Buck and Ryan's Lathe Department. Drummonds, Milnes, Myford, Exe, Union, Portass, Edgar, Bantam, Boley-Lienen, I.X.L. 5" Leader, Master, and many other well-known makers. Send your enquiries to our special Lathe Department M.—310-312, Euston Road, London.

Wade Lathe Screwcutting Attachment, 15s., post 1s. 3d. extra.—AIRD, Gardner Street, Brighton.

Burnerd Chucks, British Made, for accuracy and lasting service. Small independent 4-jaw with steel bodies, and reversible jaws, minimum weight and overhang, ideal for model, instrument, and precision work, 3½", 20s., 4", 21s.; 4½", 25s.—Below.

6 in. Independent Model with semi-steel body, suits Drummond 3½" and 4", and larger lathes, 50s.—Below.

3 in. 3-Jaw Lever Scroll Model with 2 sets jaws, 27s 6d. Small overhang, light weight. Descriptive lists, with backplate prices, on request. All postages extra. Obtainable from all tool dealers; or from: F. BURNERD & Co., Dryburgh Works, Dryburgh Road, London, S.W.15.

Lathes, Power and Treadle, by all the leading makers, in stock. Send your inquiries.—ROSS & ALEXANDER (LONDON), LTD., 165, Bishopsgate, E.C.2.

Reduced Prices: Eureka H.S.S. Ball Bearing Drilling Machine, Filing Machines, Rotary Tables, etc. Drilling Machine Drawings and Castings from 10s. 6d. per set. Photos 3d. each.—POYSER, Peck's Hill, Mansfield.

The "Myford" 3" Lathe. The modern tool for Amateur and Engineer. Used by Technical Schools, Instrument Makers, Garages and Production Works. Moderate Price. Illustrated List from—THE MYFORD ENGINEERING Co., Neville Works, Beeston, Notts.

Milling Attachments, Dividing Heads, Circular Table.—WHEELER Co., LTD., Trench, Wellington, Shropshire.

Complete Portable Workshop Layout from £20 upwards; see advert. June 27, '35; large photo, 1s.—BLACKSHAW, Sunderland Street, Macclesfield.

Ideal Lathes, 3" Centres; S.C.B.G. Camp Rests; Quick return to Saddle. 3½" Lathes, S.C.B.G. Camp. Rests. Lists. Stamp please.—WILLIMOTT AND SON, Nevilles Factory, Chilwell, Notts.

Lathes, Model Makers' and Engineers', Drummonds, 3½" to 6" centres. Treadle or Power; from only £5 0s. 0d. Stamp reply.—FORD, 174, Vicarage Road, Leyton, E.10.

Portable Workshop, 11 ft. by 9 ft., fitted shelves, bench, wood floor, Screw Cutting Lathe, Electric Motor and Tools. Sell lot for £30.—HAWKSFORD, 139, Eton Road, Ilford.

4½ Britannia Screwcutting Lathe, with combined Electric Motor, £22; Small Engine and Dynamo, £18.—E. DESPARD, High Street, Burnham-on-Crouch, Essex.

Horizontal Bench Milling Machine, £4 10s. 5½ h.p. Electric Motors, A.C., 200-240 volt, £2 each; Siemens 200 volt Dynamo, 25s.; Small Bench Power Grinder, 15s.; Philips H.T. Charger, 15s.; Electric Hand Riveting Machine, 15s.; Large Ampmeter, 50 amps., 15s.; C.A.V. Dynamo, 8 volts, 6 amps., 7s. 6d.; 4 h.p. Twin Cylinder Petrol Engine, W.C. Needs slight attention, 15s.—APPLEYARD, 88, Langsett Rd., Sheffield, 6.

Drummond Lathe, 3½", S.C.B.G. round belt, treadle, stand, chucks, excellent condition, £6 10s., appointment.—The Spinney, Woodfield Hill, Coulsdon.

3½" Drummond Lathe, S.C.B.G., treadle, cushman self centring chuck, two sets jaws, face plate, tool rest, complete change wheels, etc., £10. Would consider offer.—CARR, Fernhill Heath, Worc.

Drummond Ball Bearing Treadle and Stand, Flat Belt, £3, or Exchange for ¼ h.p. A.C. Motor.—89, Sunbridge Rd., Selsdon, Surrey.

6½" Back-Geared Screwcutting Lathe. Modern. After seven.—7, Evanston Gds., Ilford.

See Advertisement Under "Electrical" for opportunity to purchase new machines.—MIDDLETON, Birmingham.

Back Gear for Drummond 4" Round Bed Lathe.—36, Devonshire Rd., Hackney.

Drummond 4" or 3½" to 4". Other make Treadle Screwcutting Lathe. State condition and price.—PLEDGER, 12, Knowle Park Avenue, Staines.

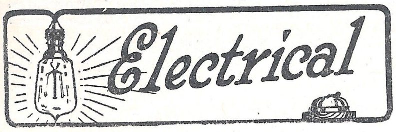
2 St. Engines and Boilers, 30s. each; Blacksmith's Anvil, £1; 4½" Heavy Leg Vice, 15s.; Oxy Acetylene Pipes and gauges, high and low pressure.—WAGNER, Blacksmith, 135, Warham St., S.E.5.

Lathes. Purchase of an Agent's Complete Stock permits us to offer the excellent 3-in. M.K.1 "Lyonite" Bench Lathe, Screwcutting with 11 wheels, back-geared, fully compound slide rest, cross-sliding milling table, gap bed, set over tailstock, automatic screw-cutting indicator, hollow mandrel with draw in spindle and collets, quick return and split nut saddle, perfect fitting slides, 7-in. faceplate and screwed and turned chuckplate, centres, square threads throughout, beautiful design and finish, with screw-cutting chart and instruction leaflet. Price £5 2s. 6d. If you pay 3 times this, you can't get better machines. Brand new. Guaranteed. Don't be in a hurry, anyone can sell you a lathe—these are lathes, not toys. Send stamped envelope, please.—Seen any time by appointment.—"M.E." 80, Ridgeview Rd. N.20.

No. 2 Flypress, 17s. 6d.; Fletcher Russell Brazing Blowpipe, 5s. 6d.; 3 Leg Vice, 5s. 9d.; No. 3 Adjustable Screw-top Flypress, 33s.; No. 4 ditto with supporting arm 63s.; Parallel Reamers, ¾ to 1⅜", 27s. 6d. doz.; D.E. 18" Bench Grinder, 26s.; Valuable "Vickers," 27s. 8d.; expanding Reamer, 9s. 9d.; New ¼" 26thd. L.H. Taps, 2s. 4d. doz.; 8" 3-jaw Independent Chuck (light model), 18s.; 8" 4-jaw ditto, 27s.; New "Norton" Grinding Wheels, 3" to 4½" dia., 6s. 9d. doz., 58s. 6d. gross; New Metal Slitting Saws, 2¾" dia., 5s. doz., 46s. gross; New Cast Steel "Two Man" Saws, 4½ ft. and 5 ft., 6s. 9d. and 8s. each.—MIDDLETON, 1257, Pershore Rd., Stirchley, Birmingham.

Dominion Gap Bed Lathe, 5½ in. Centre, Hollow Spindle, S.S.S.C., Accessories, Countershaft.—THOMPSON'S, Garage, Shaw, Manchester.

Circular Saw Table, 8", ball bearings, as new, £2; Compressor by Colour Spray as new, half price, £3 10s.; Good Adjustable Reflector Light, new, 10s.—NEWTON, Laurels, Jubilee Rd., Mytchett, Surrey.



Now on Sale, "Practical Electrician's Pocket Book, 1936," 2s. 10d., Post Free.—Dept. E.M. 3, Odhams Press, Ltd., 85, Long Acre, London, W.C.2.

Exceptional Offer. New ¼ H.P. A.C. Single Phase Motors, 200/240 volts 50 cycles, 1,420 r.p.m., double shaft pulley, 50s.; ½ H.P., ditto, single shaft, pulley, 68s. 6d.; 12 months' guarantee.—Allam, 6, Great James Street, London, W.C.1.

Electric Motors, second-hand, guaranteed, all sizes, low prices.—Geeco, Ltd., 47, Pitt Street, Glasgow.

¼ H.P. A.C. and D.C. Motors. Get my quotation before you buy.—John M. E. Steel, Bingley.

A.C. Induction Motors, all Voltages. New. 1/25 h.p., 18s.; 1/10 h.p., 35s. Electric Grinders, 21s.; Electric Drills, 39s. 6d. All Carriage paid. Trade supplied.—John M. E. Steel, Clyde Street Mills, Bingley.

Surplus Engineering and Electrical Materials, Tools and Appliances, low price.—London Electric Firm, Croydon.

Single and 3-phase Motors, all sizes from ¼ h.p. upward.—Below.

D.C. Motors, all sizes and voltages in stock.—Below.

Charging Dynamos, various voltages and amperages.—Below.

Motor Generators, single and 3-phase to D.C.—Below.

Petrol-Electric Plants, all sizes from 150 watts. to 2 kilowatts. Stuart, Petter, Lister, Kohler, etc.—Below.

Repulsion Induction A.C. Motors, all sizes to 15 h.p.—Below.

½ h.p., 220 Volt. D.C. Motors. Bargain prices.—Below.

Quick Release Drill Chucks, unused, ideal or repetition work.—Below.

All Goods Offered Above are Guaranteed in first-class condition.—Cole, Milo Works, Milo Road, East Dulwich, S.E. 22. (Forest Hill 4422.)

¼ h.p. new Ball-bearing Universal Current Motors; all voltages, 33s.—John M. E. Steel, Bingley.

¼ h.p. D.C. Motors. 200-240 volts, ball-bearings, perfect, 22s. 6d. each; A.C. Repulsion Induction, 200-240 volts £2 2s. 6d. each; other sizes cheap.—Johnson Engineering, 86, Great Portland Street, London, W.1.

Several Direct Coupled Electric Generating Sets, 50/75 volts, 20, 30, 50 amps., £17 10s. £20, and £25 each; 1½ h.p. Modern Oil Engine, £7 10s.; several 100 volt, 12/15 amp. Dynamos, £4 each; 50 volt, 10 amp. Higgs Dynamo, new, £3 17s. 6d.; Petter 50 volt Lighting Set Engine and Dynamo on cast base, £14 10s.—Woodman, South Muskham, Newark.

B.T.-H. ¼ H.P. Motor, single phase, 200/250 volts, A.C., 30s.—Perryman, 73, Ramsay Road, Forest Gate.

Brand New ¼ H.P. A.C. "Century" Motor, 230 v., 1,460 revs., 48s.—7, Evanston Gards., Ilford.

"Higgs" Motor Generator, new, 6 h.p.. 230 v., 50 cycles to 110 v., 2.5 amp. Dynamo, 68s.—Below.

Electric Driller and Grinder (Flexible Drive Co.) ¾ h.p., 440 v. A.C., B.B. Motor, Armoured Flexible Shaft 1¼" dia:, 9 ft. long. All accessories, equal to new. Listed £27. Bargain, £7 5s.—Middleton, 1257, Pershore Rd., Stirchley, Birmingham.

"Dynamo Design and Construction." By A. H. Avery, A.M.I.E. With 224 illustrations. General Principles—Parts of a Dynamo or Motor and their Functions—Types of Armatures—Field Magnets—End Shields, Bearing Brackets, Bearings, Brush Gear, Terminal Boxes, etc.—Commutators, Brushholders, Rockers, Brushes, Bearings, etc.—Proportions and Output Considerations—Armature Windings and Connections—Field Windings—Insulation, Testing, Temperature—Design and Details of a Modern Commercial 100-watt Generator, etc. Price 4s., post free.—Percival Marshall & Co., Ltd., 13-16, Fisher Street, London, W.C.1.

5 H.P. D.C. 110 Volts Electric Motor. Want to Exchange for 200 Volt A.C. 2 H.P. Motor or Sell.—116, Marion Street, Cardiff.

Unusual Opportunity to purchase New Bench Drilling Machine ⅜" capacity, 2 speeds; new "Neco" ¼ h.p. A.C. 50 cycle, 220/240 v. Motor, and new Stanett Metric Micrometer, all bought three weeks ago for £6 15s. Selling through appointment abroad, 65s. the three.—Newton, 969, Bristol Rd., South Northfield, Birmingham.

"Electric Testing Simplified." A practical manual and bench companion. The chapters in this book give a full description of various Measuring Instruments, Electro-Mechanical Aids to Testing, the Voltmeter and Ammeter, Meter for Special Purposes, Notes on the Reading, Care and Maintenance of Meters, Insulation Testing and Inspection, Electrical Resistance Tests, Domestic Electric Appliances, the Testing of Cells, Industrial Dynamo and Motor Testing, and Testing Motor Car Electric Plant. 190 pages, 103 illustrations, well indexed. Price 5s. 6d. post free.—Percival Marshall & Co., Ltd., 13-16, Fisher Street, London, W.C.1.

QUERIES and SERVICE DEPARTMENT REPLIES.

(1) Every query and Service Enquiry must be accompanied by a coupon from the current issue, and should be addressed "Query Department" or "Service Department," The Model Engineer, *13-16, Fisher Street, London, W.C.1.*

(2) Short queries of a general character within the scope of the paper are replied to free of charge provided a stamped addressed envelope is enclosed.

(3) Queries of a general character are not replied to by post, except by special arrangement. They will be dealt with in turn either by a short explanatory article in an early issue, or will be published as letters inviting a helpful response from other readers.

(4) Where technical informaion by post is specially desired a charge will be made. The query will be handed over to a selected expert on the subject, who will quote his fee for the service required direct to the querist. **All queries asking for the winding details for dynamos, motors, and electric apparatus must be accompanied by a fee of 3s. 6d.;** *a similar fee is charged for any subsequent letters of advice required. A stamped addressed envelope must be enclosed in all such cases.*

"The Model Engineer"
QUERIES and SERVICE DEPARTMENT REPLIES COUPON
To be cut out and enclosed with each Query or Service Enquiry sent in during the week commencing
January 16th, 1936
Read the Rules before posting your Query.

Staggering "Universal" 1936 Bargains. 100 excellent Single Cylinder Magnetos, all good Sparkers (small) neat. 4s. 9d. each.—Below.

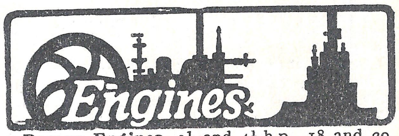
10 Only (enclosed) Modern Design 12 volt app. 1/3rd. D. C. Motors. Instantaneous starting, 14s. 6d. each.—Below.

Handsome 5" Centre Genuine I.X.L. Screwcutting Lathe, with countershaft, change wheels, face plate, centres. Back geared, Hollow Mandrel, distinctly modern, £14 18s. 6d.—Below.

A very sturdy 6" Centre 6 ft. Gap Bed screwcutting Lathe, with full set change wheels, countershaft, face plate, centres, Chuck, and many lathe tools. A gift, £11 18s. 6d.—Below.

Lighting and Charging Installation, a real serviceable "Garage" charging plant. Comprising very sturdy 2-2½ h.p. Bentall petrol-paraffin engine, with fuel tank, silencer, water reservoir, starting handle. Very easy starting, with standard Impulse Start magneto ignition. Driving a handsome slow speed enclosed type Ball Bearing Modern Shunt-wound Lighting and Charging Dynamo, giving an app. output of 50-75 volts, 10-12 amps. Switchboard included, fitted with ampere meter, main switch, double fuses, and charging switches. For this very serviceable installation, we can accept the modest price of £9 18s. 6d. If you want a real sound charging installation, "Wire" by all means; it will soon be snapped up.—Universal Motor Company, St. James Road, Derby.

Lighting Set, 600 Watt, 100 Volts, Stewart Petrol Engine, Switch Board Volt and Ampere Meters, Two Automatic Cutouts, £15.—Humphrey, 21, Langley Road, Elmers End, Beckenham, Kent. Bec. 0766.



Demon Engines, 3½ and 4½ h.p., 18 and 20 gns. each. 1½ and 2½ h.p. Castings if required.—Vauxhall Works, Longton, Staffs.

Galvanised Tanks, suitable engine cooling oil or water storage, 60 gallons, 15s.; 100 gallons 20s.; 160 gallons, 35s.; new, carriage paid.—Abbey, Watton, Norfolk.

3½ H.P. Crossley Oil Engine, £2 15s.; 2½ h.p. Hamsworthy Oil Engine, 35s.; 1 h.p. W.C. Boat Engine, 20s.; 36-42 volt, 31 amp. Charging Dynamo, perfect, £2 10s.; 100 volt Motor, approx. 1 h.p., £1 10s.; Two Large L.T. Magnetos, 7s. 6d. each; Large Panal Volt and Amp. Meters, 5s. each. All perfect. Stamp.—Pilbeam, Underoak, Burgess Hill.

New L.N.E.R. Tank, Scale C/W., G.O. 4-6-2, 50s.; Vertical, ¾ by ¾ Stewart Steam Engine, 20s.; Brass riveted Vertical Boiler, Cross tubes, 20s.; Bowman Horizontal Steam Engine, 10s.; Small W.C. Stationary Engine Unit, complete, £5 10s.—Britnell, 58, High Road, Chiswick, W.4.

New Steam Engine Bore, 2¼" by 2". Bargain, £4. Approval.—Matthers, Wrawly Brigg, Lincs.

High Tension from 2 Volt Accumulator. Instructions, 2s. 6d.; Electric Air Purifier Instructions, 1s. 6d.—Johnson, 6, Fordcroft Rd., St. Mary Cray, Orpington, Kent.

The Mathematics of Wireless, by Ralph Stranger. This book is essential for the wireless amateur who desires to gain a fuller knowledge of his subject. Written by one who has the gift of explaining abstruse subjects in a simple fashion, it will enable its readers to attempt research and experiments which at one time were far beyond their powers, 256 pages, fully illustrated. Price 5s., post free 5s. 6d.—Percival Marshall & Co., Ltd., 13-16, Fisher Street, London, W.C.1.

Television and Short Wave Handbooks, by F. J. Camm. An up-to-the-minute and lavishly illustrated book written in easily understood language, dealing with every branch of television. Instructions are given for making simple vision machines and short-wave receivers and adaptors. A useful dictionary of television terms is included, 3s. 6d.; postage 6d.—Percival Marshall & Co., Ltd., 13/16, Fisher Street, London, W.C.1.

Lathes, from 3½" to 6", Drummond, Britannia, I.X.L., Edgar, Exe, Zyto, Patric, Eta, Milnes or any other good make purchased for cash.—Ross & Alexander (London), Ltd., 165, Bishopsgate, E.C.2.

Small Good-Class Electrical and Mechanical Models, Chemical and Scientific Apparatus, Tools, Measuring, Meteorological and other Instruments Wanted.—Andrews, 27, New Bailey Street, Salford.

Wanted. Stuart "Lightweight" 30 cc. Engine, water-cooled head essential; also Sight Feed Carburettor, must be complete running order.—Anderson, Sunnyholm, Keswick Road, Great Bookham, Surrey.

Precision Collet Lathe, Shaper, ½ in. Sensitive Drill, ¼ to 1 h.p., 230 D.C. Motors and Starters, Milling Machine, good condition essential.—Engineer, 59, Lord Street, Macclesfield.

Urgently Wanted, Second Hand Motor Cycle and Car, Spares, 250 A.K.D. Engine, Tools.—Eric Mayes, 12, Laburnum Terrace, Londonderry.

Lathes Purchased for Cash. We are the leading London mart for all types of machines up to 6"; Drummonds, Britannia, I.X.L., Edgar, Exe, Eta, Milnes, Myford, or part exchange for new machines. Service with courtesy.—BUCK & RYAN, Dept. M., 310-312, Euston Road, London, N.W.1.

Wanted, Petrol Engine ½ h.p. 90 v., water cooled.—WARD, Millwright, Thornboro Well, Bedale.

Lathe, 3" to 4" B.G.S.C. Fully Compound, Long Bed, Accessories, Countershaft; Motor 250 A.C., 50 cycles. Good order. Deposit system.—112, Liverpool Rd., Widnes.

Wanted, ¾" Scale Loco., complete or otherwise. Boiler about 10" by 20", W.P. 70 lbs., coal-fired.—LEWIS KETTLE, Hawkinge, Folkestone.

Model Sailing Ship, Galleon type preferred. Water turbine to drive 3 h.p. Dynamo.—GOLDING, Fishing Cottage, West Lavington, Wilts.

Stanley "45" Pair Field Glasses. Cash, or Exchange Shafting and Pulleys, which are for sale.—BRADLEY, Joiner, Holland Road, Old Whittington, Chesterfield.

Drummond 6" T Type, New, Second-hand Power Electric otherwise.—2, Third Avenue, King's Park, Glasgow.

12 v. Car Dynamo and Magneto, 10s.—KING, 9, Lyric Rd., S.W.13.

Modern Motoring Manuals. "The Motor Manual," 2s. 10d. post free. "The Petrol Engine," 3s. 10d. post free. "Compression Ignition Engines for Road Vehicles," 2s. 9d. post free. "How to Drive a Car," 2s. 9d. post free. "The Motor Repair Manual," 2s. 9d. post free. "The Motor Electrical Manual," 2s. 9d. post free. "Motor Cycling Manual," 2s. 10d. post free. "The Motor Boat Manual," 5s. 5d. post free. "The Motor Ship Reference Book," 5s. 6d. post free.—PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street, London, W.C.1.

Castings in All Metals, Machined or Rough. Name Plates, Steel Stamps, Stampings. Experimental Work and Small Mechanisms —HILLIER & SON, 3, Beaufort Gardens, London, S.E.13.

Inventions Patented. J. E. S. Lockwood, 3, New Street, Birmingham. Advice and Guide Free.—Established 21 years.

J. B. S. Poyser, Peck's Hill, Mansfield. Scientific Instrument and Inventor's Model Maker, Spiral, Bevel and Spur Gear Cutting, Turning and Milling. Established over 30 years. 'Phone 148.

The Patent Agency for Inventors with limited means. Development, patenting and exploitation of inventions by technicians skilled in every branch of technology. Patent specification by patent agent with 14 years' experience of British and foreign patent practice. Consultation free. Write for prospectus.—THE IMPERIAL PATENT SERVICE, First Avenue House, High Holborn, W.C.1. Telephone, Hol. 9191. Telegrams, "Imperatrix, London."

Half "Shop" Prices. New Watches, Clocks, Expanding Bracelets, etc. (chrome a speciality). List 6d. Materials and Tools, "Invar," Silver and Mild Steel. Repairs and Wheel-cutting a speciality. List 6d.—YOUNG & SON, Material Dealers, Chippenham.

Castings, Forgings, rough or machined to drawings or patterns, all classes of machining done, models made, inventors helped.—W. BADGER, Cupola Engineering Works, Rotherham.

Grooved Pulleys. Shafting, Bearings, Belting. Price Lists on application.—THE GROOVED PULLEY Co., 27, Jesse Road, E.10.

Patents Trade Marks. Free Advice, Handbook, and consultations.—B. T. KING, C.I.M.E., Patent Agents, 146s, Queen Victoria Street, London, E.C.4. 50 years' references. City 6161.

High-class Light Mechanical Work, Repairs, etc. Estimates free.—LEWIS GATENBY, Engineer, 17, Thornton Lodge Road, Huddersfield.

Situations Vacant

"The Engineer's Guide to Success," shows how to qualify by home study for the better-paid posts, many of which are notified to our Employment Department. Write to-day for FREE copy of this Great Guide which gives full particulars of the Regulations governing admission to the Examinations for A.M.I.Mech.E., A.M.I.E.E., A.F.R.Ae.S., etc. —and which contains the widest choice of engineering courses in the world—over 200 Courses. Mention branch, post, or qualification that interests you.—THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN, 1, Temple Bar House, London, E.C.4. (Founded 1917. 19,000 Successes).

ENGINEERS—REMARKABLE OFFER.

Our new Engineering Guide explains clearly how all the best jobs are secured. It shows how to obtain such money-making qualifications as A.M.I.C.E., A.M.I.E.E., A.M.I.Mech.E., A.M.I.W.T., A.F.R.AeS., etc. How to secure permanent and progressive posts in the Government and Municipal Service; and describes numerous "Better-pay" courses in Civil, Electrical, Wireless, Auto and Aero., etc. Engineering. Write to-day for FREE copy of this Authoritative publication and details of our remarkable Guarantee of Success.—NATIONAL INSTITUTE OF ENGINEERING (DEPT. 9), Staple Inn Buildings, High Holborn, W.C.1.

G.P.O. Engineering Dept. (No experience required.) Commencing over £4 per week. Age 17-23. Excellent prospects. Free details of Entrance Exam. from—B.I.E.T. (Dept. 510), 17-19, Stratford Place, London, W.1.

1936 EDITION—FREE.

Ambitious Engineers. Our new 268 page Handbook shows clearly how to secure a recognised qualification, such as A.M.I.Mech.E., A.M.I.E.E., A.M.I.A.E., A.M.I.W.T., A.M.I.R.E. We guarantee "NO PASS—NO FEE." Our book outlines over 100 Exams., and courses in all branches of Civil, Mech., Elec., Motor, Aero, and Radio Engineering, Building, Television, Government employment, etc. In your own interests, we advise you to send for your copy of this enlightening Handbook to-day—FREE and without obligation.—BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 13, Shakespeare House, 17-19, Stratford Place, Oxford Street, W.1.

You Can Use Your Spare Time to Start a Mail Order Business that quickly brings you a full time income. Follow the lead of others who are averaging £12 per week net profits. Get away from a drudging routine job—join the big-money class. No previous experience necessary. Few pounds capital only needed. No samples or outfits to buy; no rent, rates or canvassing. New method makes success certain. Write to-day for Free Booklet to—BUSINESS SERVICE INSTITUTE (Dept. 477C) 6, Carmelite Street, London, E.C.4.

Mechanic and Improver with knowledge of overhauling and installing electric motors, required by London firm of Bakers' Engineers.—Box 943, MODEL ENGINEER Offices.

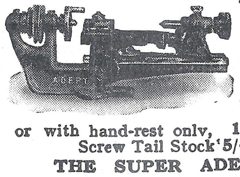
PLEASE GIVE US A CALL AND INSPECT OUR 'USED MACHINERY DEPT.'

or write for particulars of any machinery (new or used) that you are interested in.

Every Lathe on the market in stock. Lathe catalogue post free.

Special Offer Catalogue of M.E. Tools, free postage, 2d.

S. TYZACK and SON, LTD.
(Department M.E. 7)
341, 343, and 345, OLD STREET, LONDON, E.C.1.



The 'ADEPT' LATHE

1⅝" centres, 6" between centres With compound slide-rest **£1**

or with hand-rest only, **12/6.** Post 1/-
Screw Tail Stock 5/- extra

THE SUPER ADEPT 30/-

F. W. PORTASS 83a, Sellers Street, SHEFFIELD.

ELECTRADIX

Fine Turning Metal for brass-bearing bushes, etc. Solid drawn, 1½ in. diam., $\frac{11}{16}$ in. bore, 4 lb. per ft., sale **2/8**; ditto, 2-in. diam., 1½-in. bore, 3¾ lb. per ft., sale **2/6.** Emery Cloth, Grinding Discs, coarse, 6½-in. diam., **2/-** doz. Larger, 9-in. diam., **4/-** doz.

Two 8½-in. Dial Chart Recorders, for Draught or L.P. to 12-in. water, **37/6** each.

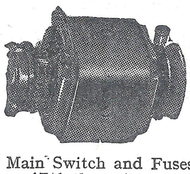
Clock-In Staffsine Employees Time Recorder, **70/-.**

Anemometer. 6-dial type reading 1-1,000,000 c. air metres by Stanley, in pocket case, **50/-.** Hill-Barnard Sphygmometer, 0-250 m Hg., **10/-.**

Mirrors. 5¼-in. diam., Helio or Television, **1/6.** Parabolic Concave, 10 in., **20/-**; 20 in., **25/-**; 24 in., **30/-.** Carr. fwd. Neon Lamps, **2/6** and **3/-** each, with holder. Miniature Neons, **2/6.**

Light and Ray Cells.—Selenium Raycraft, **21/-**; Kingston, **15/-**; Raycrait outfit with relay and amplifier, **45/-. Photo-Cells,** or sound on Film, Television and Ray Work, B.T.P., **15/-**; R.C.A., **25/-**; G.E.C., **25/-** to **70/-.** Beck Angle Prisms, mounted in carrier, **5/6.** Micrometer adjusters for lens, **1/-.** Eyepieces with prism and lenses for photo-cell inspection, **12/6.** New Ever-Ready Service Inspector's Handlamps with Battery Holder, **7/6.**

Thermometers. Panel, 2½-in. clock dial, 5 ft. of ether tube, for distant indicating, reading 0 to 100°C., **7/6** and **10/6.** Straight 0 to 100°F., 3 in., 6 in., and 12 in. for **1/4.** Pocket, 5 in., Clinical, **9d.** R.A.F. Air Speed Aero Indicator, **10/6.**



Dynamos. Bargains. For Charging or Lighting. 240-watt Enclosed Dynamo, 12/20 v., 12 amps, Ball Bearings, Vee Pulley, Type C, **25/-.** Marine type Switchboard with Ammeter, maximum and minimum Auto Cutout Main Switch and Fuses. Field Regulator, **25/-** or **47/6** the pair.

Double Current Generators, D.C., 600 volts, 100 m.a., and 6 volts 3 amps., **40/-.**

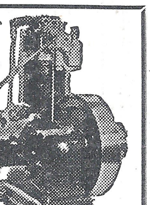
Binoculars and Telescopes. Prisms, **55/-**; Field, **40/-**; Precision, **15/-**; Navy Telescopes, 24-in. Gun Type, **17/6.** Hand Range Telescopes, **25/-.** Stick Periscopes, 3½ in. by 1½ in. Mirror and Cover, Swivel back, **6d.**

Commutators. An opportunity for amateurs Engine built, 24 copper segments, mica insul. Worth 7/6. Sale, **2/6.**

Heaters. Immersion heaters, 110 volts, **2/6**; 220 volts, **3/6**; hot plates, 110 volts, 500 watts, **3/6**; 660 watts, **5/-**; 3-heats, 220 volts, Toasters, **7/6**; **17/6**; wax heaters, 100-250 volts, **15/-**; bowl fires, 220 volts, bronze finish, **7/6**; ½ kw. bar fire, **8/6**; 1 kw., 220 volts, **17/6**; Electric Soldering Irons, from **5/6.**

Latest Bargain List M.E. Free

ELECTRADIX RADIOS,
218, Upper Thames Street, E.C.4.
Telephone: *Central* 4611.



For DYNAMO DRIVING up to 500 watts:

1 h.p. HARTOP H type PETROL ENGINE water-cooled, governed, ball-bearing, automatic lubrication £8 18s. od.

DELIVERED on first of twelve equal monthly payments 14s. 10d. through J. G. Graves Ltd., Sheffield.

Send for illustrated lists of all HARTOP ENGINES and Sets of Parts.

Frank Hartop & Sons, Miller Rd., Bedford

FROST & CO.,

70, Old Compton St., London, W.1.
Engineers, Tool and Model Makers.

ACCURATE WORK. QUICK DELIVERY.

All small Repair Work undertaken Patterns, Castings, or Finished Parts. Small Stampings and Press Tools.

Experimental and Repetition Work

The MODEL ENGINEER'S DIARY OF FORTHCOMING EVENTS.

January 17th-18th — Altrincham Model Power Boat Club. Exhibition of Models at Public Hall, Altrincham, Cheshire.

January 17th—Junior Institution of Engineers. Informal meeting. "Discussion on the future of the General Engineer's Shop," by F. T. Woods. 7.30 p.m.

January 20th—Glasgow Society of Model Engineers. Visit to L.M.S. Railway Running Sheds at Polmadie, 7.30 p.m.

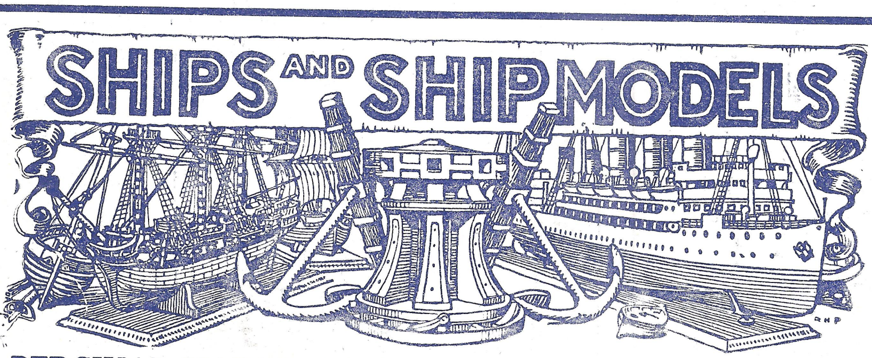
January 23rd—Romford Model Engineering Club. Lecture by Mr. J. N. Maskelyne on "Locomotives that have failed in their Expectations."

January 23rd—Society of Model and Experimental Engineers. Competition, Track and Model Night.

January 29th—Park Model Aircraft League. Second Annual Dance and Exhibition of Models at Farnan Hall, Streatham, 7 p.m. to 12.

January 31st—Kent Model Engineering Society. Demonstration by Mr. W. J. Hillier on "Hardening and Tempering Small Tools," Sportsbank Hall, 8 p.m.

February 11th—Kent Model Engineering Society. Talk by Mr. H. L. Smith on "Model Locomotive Constructional Hints." Sportsbank Hall, 8 p.m.



THE MAGAZINE FOR ALL LOVERS OF SHIPS AND THE SEA

Price 6d. monthly.
Post Free 7½d.

ANNUAL SUBSCRIPTION
Post 7/6 Free

PERCIVAL MARSHALL & CO., LTD., 13-16, Fisher Street, LONDON, W.C.1

THE RATE is 1d. per word throughout — Minimum Charge One Shilling

The CLASSIFICATIONS are

General, Models, Wireless, Motoring, Tools, Engines, Electrical, Business, Wanted

(Please put a ring round Section applicable to this advt)

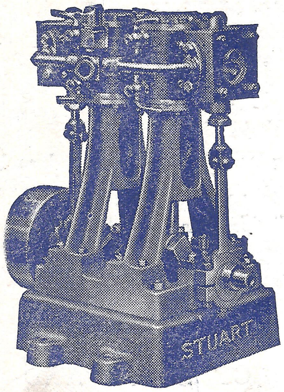
						1/-
						1/6
						2/-
						2/6
						3/-
						3/6
						4/-

PLEASE WRITE IN INK.
Name and address are charged for, and *compound words count as two words.* Box Nos. are charged 6d. extra for postage, and must conclude as follows: "Box——, MODEL ENGINEER Offices"—these words are charged at the usual rate.
ALL ADVERTISEMENTS MUST BE PREPAID.

USE THIS FORM and post (not later than Thursday for following week's issue) with remittance to cover cost to The Advt. Manager,
"The Model Engineer,"
13-16 Fisher Street, London.

A supply of "Smalls" forms will be sent post free upon application.

MARINE & ELECTRIC
LIGHT ENGINES.



THE DOUBLE
No. 10V.
$\frac{3}{4}'' \times \frac{3}{4}''$

Twin Double acting with slide valves.

No dead centres, always starts when steam is turned on.

Castings .. 20/-
Machined 40/-
Finished 110/-

Full specifications of this and other Stuart Engines in the BLUE Book 6d.

STUART TURNER LTD.,
Henley-on-Thames.

BOND'S
'MAXIMUS' Milling Machine

The heaviest and strongest Model Maker's Milling Machine Made.

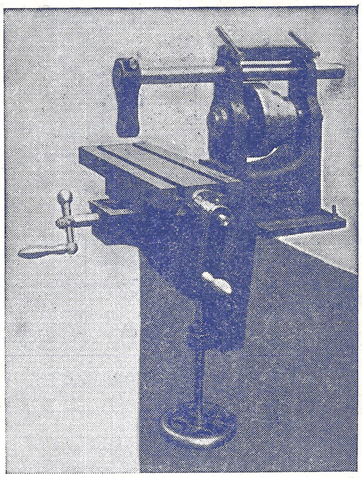


Table 14″ × 5⅛″

Table traverse 10½″ × 4″

Vertical rise and fall 7″

Mandrel-bored No. 2 Morse taper

Weight 102lbs.

PRICE
£7.19.6

Cutter Arbor with collars
8/6

All prices carriage forward.

Send for our 1936 Catalogue 6d. post free, it contains list of L.B.S.C. Castings, Steam Fittings, Materials and Tools.

BOND'S O' EUSTON ROAD, LTD.,
254, Euston Road, London, N.W.1,
Phone: Museum 7137. Established 1887.
French Agents:—Messrs. J. Fournereau, 60, Rue Alphonse-Pallu, Le Vesinet (S. & O.)
S. Africa Agents:—Messrs. J. Alcock & Co., 69, Mooi St., Johannesburg

An Attractive Offer

Give this your careful ATTENTION for a few moments

We have a small stock of parts of that most interesting and instructive work

WONDERFUL MODELS

The most fascinating encyclopaedia of model making ever published

We will supply 12 parts, each different, at 6/- inland, 6/6 abroad whilst our stock lasts

EARLY APPLICATION SECURES A "LOT"

Each part contains a design for a model as a folding plate with details of the model illustrated and 64 pages of interesting articles relating to all kinds of model making. Fully illustrated.

A splendid present for a boy

A purchaser says: "I am highly satisfied with them." 3.12.35

SEND NOW

PERCIVAL MARSHALL & CO. LTD.
13–16 Fisher Street, London, W.C.1

Printed in Great Britain for the Proprietors by Electrical Press, Ltd., 13-16, Fisher Street, Southampton Row, W.C.1, and published by Percival Marshall & Co., Ltd., 13-16, Fisher Street, London, W.C.1.